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Motor Ship Suecia

A Four-Stroke Diesel-Engined Cargo Vessel of 2,000 B. H. P. Advancement of the Type

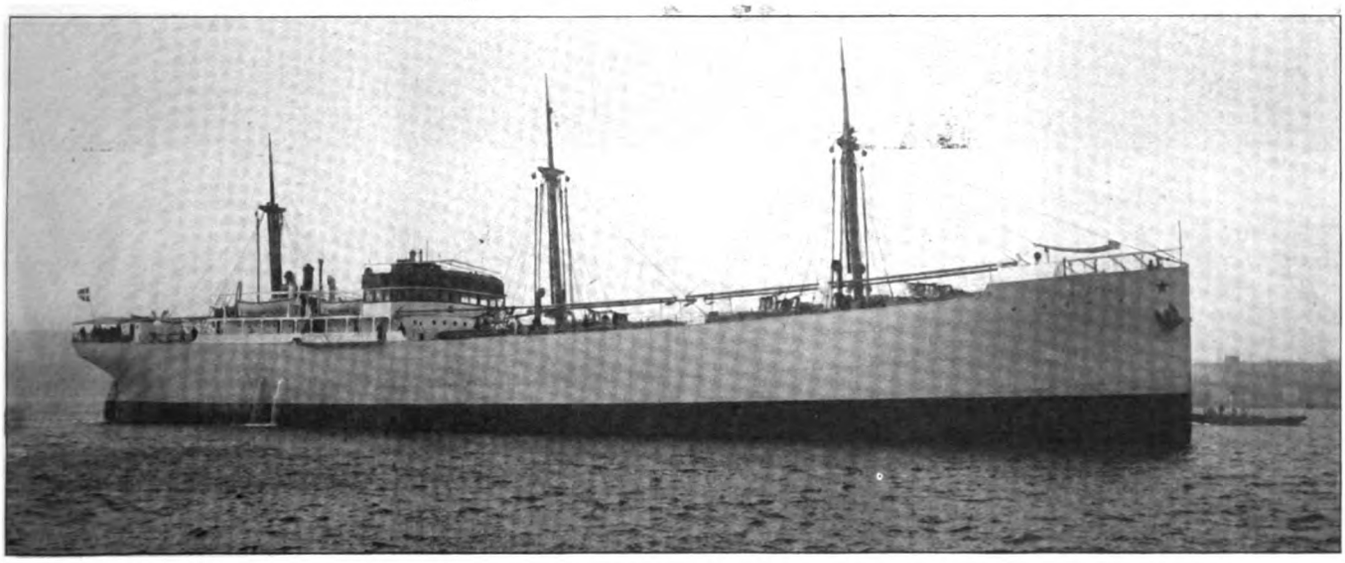
By J. Rendell Wilson

IN many quarters it is upheld that the two-stroke type Diesel engine will be generally adopted for marine work, yet out of 75 commercial motor craft of this class of over 100 ft. in length no fewer than 45 have four-stroke engines, the average horsepower being well in favor of the four-stroke system; while out of 53 vessels now under construction 33 are also of the four-stroke type. Also it must be remembered that the highest powered Diesel ships building, in other words, 4,000 H. P., will have this class of engine. But if one is to judge by actual facts as they are present then the four-stroke engine is undoubtedly going to remain premier, as of the vessels building at the time of writing the total horsepower in this type is 61,500 B. H. P., while the total horsepower of the two-stroke engines under construction is by 34,250 B. H. P. In view of these figures, surely the time is hardly ripe to assume that the two-stroke Diesel will be the engine generally adopted. One of the reasons given is that valve troubles will largely be eliminated, but according to the design of some of the latest high powered two-stroke motors such a reason at once becomes an absurdity, as in most of them valves are freely employed, one particular engine having no fewer than six valves per cylinder in addition to an exhaust port.

Burmeister & Wain, Copenhagen, who built the Selandia, have run the trials of their third Diesel-driven ship and in addition have nine more on order of a total tonnage of 63,200 tons D. W. C., and 24,000 B. H. P. Five of these are for the East Asiatic Co., one for the Redericktiebolaget Nordsjernan, of Stockholm, two for the Forenede Dampskib Selskab, and two for another continental firm—all machinery will be of the four-stroke type. Suecia, as the new vessel is named, is also for the Redericktiebolaget Nordsjernan, and has recently gone on her maiden trip to the Argentine, after successful trials with the ship loaded. Her leading dimensions are as follows:

	Ft.	In.
Length, overall	362	0
Length between perpendiculars	360	0
Breadth	51	3
Depth from shelter deck	34	0
Molded depth	25	6
Draught	23	1
Deadweight capacity, tons	6,520	
Total indicated horsepower	2,300	
Speed, knots	10¾	

She is a twin-screw vessel, and each of her main engines has eight cylinders, with a bore of 500 mm. by 660 mm. stroke, and develops 2,000 B. H. P., at 140 r. p. m. on the four-stroke principle. They are of the enclosed single-acting direct reversible class with crossheads, trunk pistons and forced lubrication, and in general design resemble the Burmeister & Wain engined motor ships Selandia and Christian X (ex Fionia), the valves being operated by long hollow push



MOTOR SHIP SUECIA

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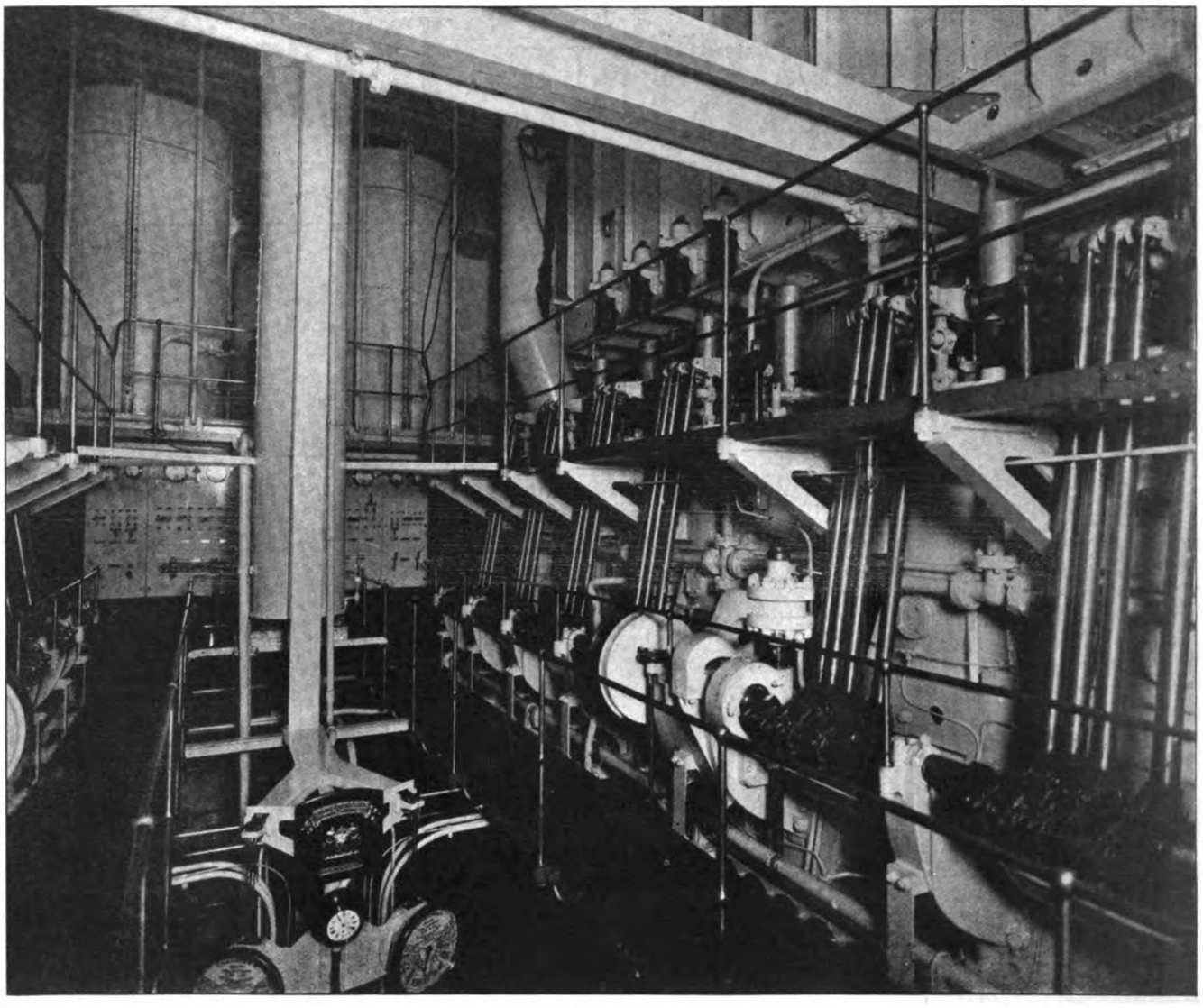

ENGINE ROOM OF MOTOR SHIP SUECIA

rods from a horizontal cam-shaft. Reversing is by sliding the cam-shaft, a small air-driven lay shaft raising the push rod rollers clear of the cams to allow of its being moved before or after. Each engine is arranged in two groups of four cylinders, each group having the cranks at 180 degrees, with the two-group at 90 degrees to each other, so that in the diagram of turning moments, the maximum is about 1.35 times the mean, thus the result is very even and eliminates vibration. As in the other respects, these engines resemble those of Selandia there is no need to further describe them.

The arrangement of the auxiliary machinery too is very similar, and this consists of two 200 B. H. P. four-cylinder non-reversible Diesel four-stroke engines driving dynamos, which supply current for all minor engine room machinery, the steering engine, anchor windlass and a number of electric cargo winches. To each of the 200 H. P. engines can be coupled an air compressor, which charges reservoir tanks to 20 atmospheres for starting and reversing the main engines. From these reservoirs the air is taken to a high-stage compressor driven off each main engine and compressed to 60-65 atmospheres for the injection of fuel.

Licenses Issued to Wireless Operators

During the first four months of the operation of the act to regulate radio communication, which took effect on December 13, 1912, the department of commerce, through the bureau of navigation, has issued 3,407 licenses to wireless operators and stations in the United States. The first grade commercial operator's licenses number 1,279, second grade 186, while 1,185 amateurs have been licensed, although work with the latter class has been delayed to push the licensing of commercial stations and operators. Eight operator's licenses of the experiment and instruction grade have been issued.

The Bureau of Standards has designed special testing instruments for the purpose of measuring wave length, decrement, etc., to reduce interference and insure the orderly use of radio communication, and these instruments are now being put into the hands of the 10 inspectors in the field, who will be fully equipped by the end of the month.

Thus far 46 American ship stations and 18 coast stations have been licensed, and this branch of the work will now proceed more rapidly; 685 amateur stations have been licensed.

The inspections already made have considerably increased the efficiency of wireless apparatus on ship and coast stations.

The wireless apparatus on ocean passenger steamers has been inspected before about 1,500 sailings from the United States during the four months.

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Launching a Battleship

Description of the Preparations Which Were Made at the New York Navy Yard for Launching the Battleship New York

NAVAL Constructors Robert Stocker and Henry Williams prepared a description of the launching of the battleship New York at the New York navy yard for the Journal of the United States Naval Institute, from which the accompanying condensation is made. The main launching particulars are given in Table I, as follows:

Table I.

Length of ship, ft.	573
Breadth of ship, ft.	95¼
Launching weight, excluding cradle, tons	9,730
Wht. of cradles complete, about, tons	500
Length of standing ways, ft.	620
Length of sliding ways (total), ft.	437½
Length of sliding ways (effective), ft.	426
Width of ground ways, ft.	5½
Width of sliding ways, ft.	5
Pressure per square foot, tons	2.39
Declivity of ways to 1 ft., in.	11/16
Cant inboard of ways to 1 ft., in.	½
Pressure of fore poppets at lifting point, tons	2,110

A launching diagram with the usual curves is shown in Fig. 1, which also shows the time record of the distance run, as observed at the launch, and the curves of velocity, acceleration, and co-efficient of friction deduced therefrom. The building supports consisted of keel blocks spaced 4 ft. apart, a number of large cribs consisting of crossed 12 in. square timbers about 20 ft. long fore and aft and 16 ft. athwartships, and a very large number of shores. At the time of launching all these supports had been removed with the exception of 119 tumbling shores.

Two months prior to the launch alternate keel blocks were removed and collapsible sand blocks (Fig. 2) substituted, each capable of supporting 125 tons. The alternate yellow pine keel blocks were left in position between these sand blocks, and were split out on the morning of the launch. The sand blocks were the last supports to be removed, and were taken out in 11 minutes. Each ground way consisted of six yellow pine baulks 12 in. thick, secured together with 1-in bolts spaced 3 ft. apart. A riband of yellow pine, 4 in. by 14 in., was fitted on the outer edge, and spur logs to prevent the ways spreading were placed 8 ft. apart on the outer sides. The sliding ways were constructed of five 12-in. yellow pine baulks, bolted with 1-in. steel bolts spaced 2 ft. apart.

The ship was held and released at the last moment by two hydraulic triggers of the type shown in Fig. 3, one being fitted to each way. Before the New York was released the pressure on the triggers attained 2,000 lbs. per square inch. A dog-shore of 14-in. square yellow pine was also provided on each way (Fig. 4), to hold the ship in case of accident to the hydraulic triggers. Four hydraulic rams were provided, two of

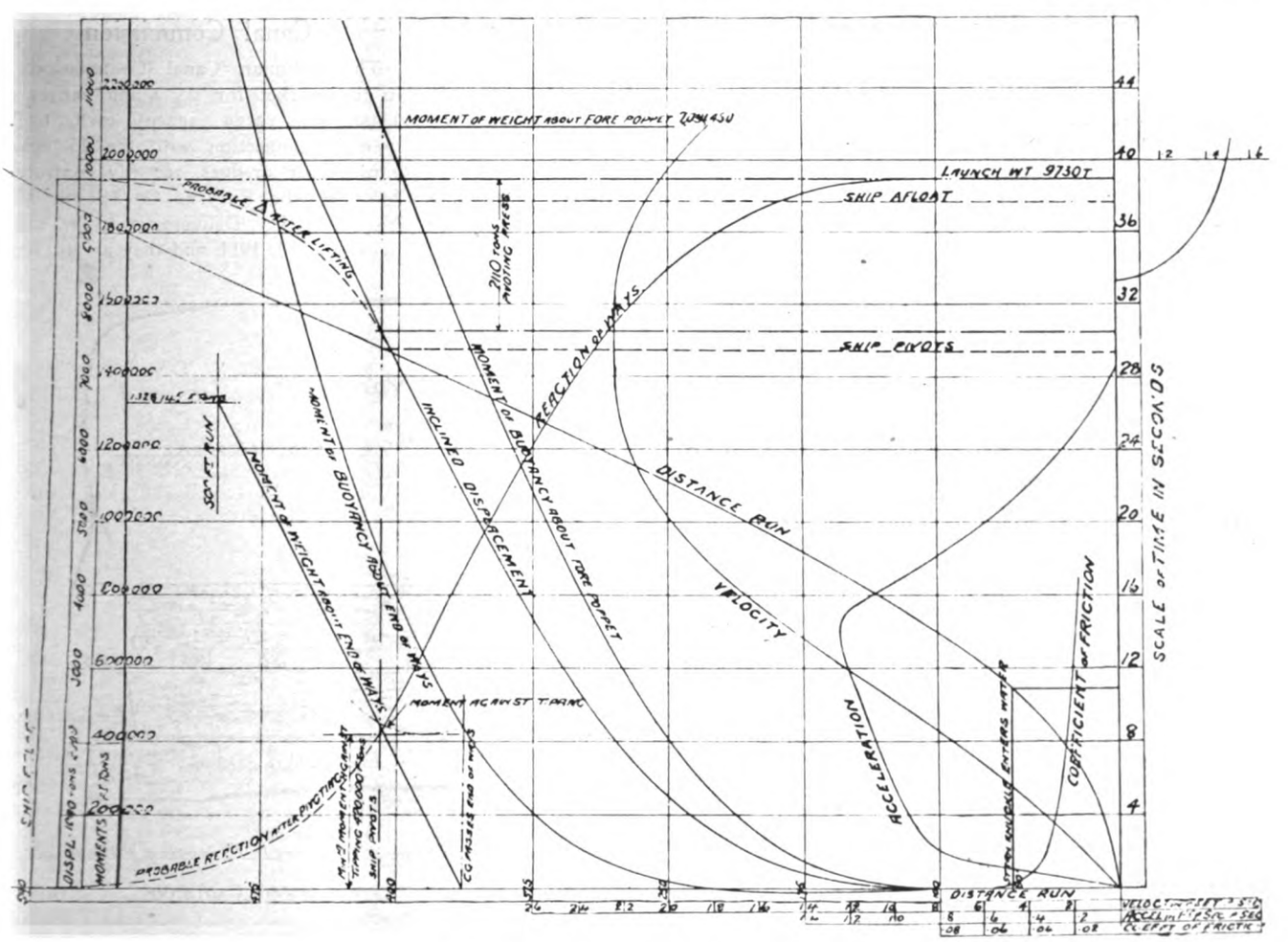

FIG. 1—CURVES OF LAUNCHING DATA

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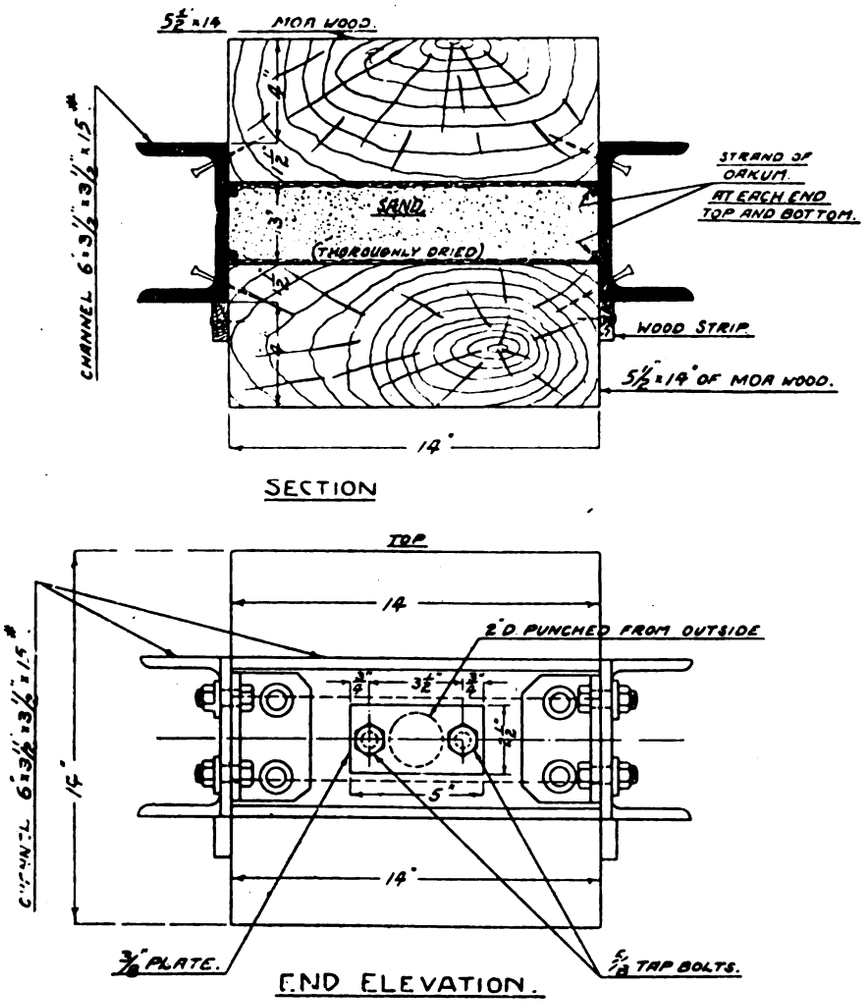

FIG. 2—COLLAPSIBLE SAND BLOCK

150 tons power, and two of 100 tons, to give initial motion to the vessel if necessary, but their use was not required.

The lubricant applied to the ways had a total thickness of about ⅝ in. and consisted of beef tallow as the principal ingredient, the other ingredients being stearine and launching grease. The launching grease was softer, and was intended to give the initial lubrication until the harder tallow melted under the friction. To prevent the grease being squeezed out during the period which elapsed between the time of application and the day of the launch, steel separators ⅝ in. thick were fitted between the sliding and ground ways at intervals of 10 ft. Lard oil was poured in the openings left by the separators just before the launch. In order to grease the submerged portion of the groundways for a distance of about 30 ft. below low water mark, two cofferdams were used, one on each way, which permitted of exposing a section of 30 ft. in length. Grease distributors were also provided, consisting of boxes, one at each end of the sliding way, filled with grease, and fitted with a weighted piston to force the grease out as the ship moved down the ways. The wedges were spaced 14 in. apart, and were of oak 8 ft. long and 6 in. square at the base. One hundred and thirty four-handed oak battering rams, 6½ ft. long and 6 in. square, were provided to drive the wedges, which were rammed up in four rallies each of six minutes duration on the morning of the launch. The force for ramming up consisted of about 500 men.

The fore poppets were constructed as shown in Figs. 5 and 6. In order to provide for the distribution of the load over the entire cradle and over a considerable length of the ground ways during and after pivoting, a circular sliding joint or trunnion was fitted on each side having a radius of 50 ft. They were greased in the same manner as the launching ways. To distribute the load on the poppets over as large a surface of the hull as possible, three straps, each about 40 ft. in length and 5 ft. wide, of steel plate, were carried under the keel, and the space between these straps and the keel was filled with cement concrete.

Dump Barges for Isthmian Canal Commission

The Isthmian Canal Commission is in the market for six dump barges of 1,000 cubic yards capacity each, to be used in connection with the 15 cubic-yard dipper dredges, recently contracted for with the Bucyrus Co., South Milwaukee, Wis. Delivery is to be made by January 1, 1914, and they are to form

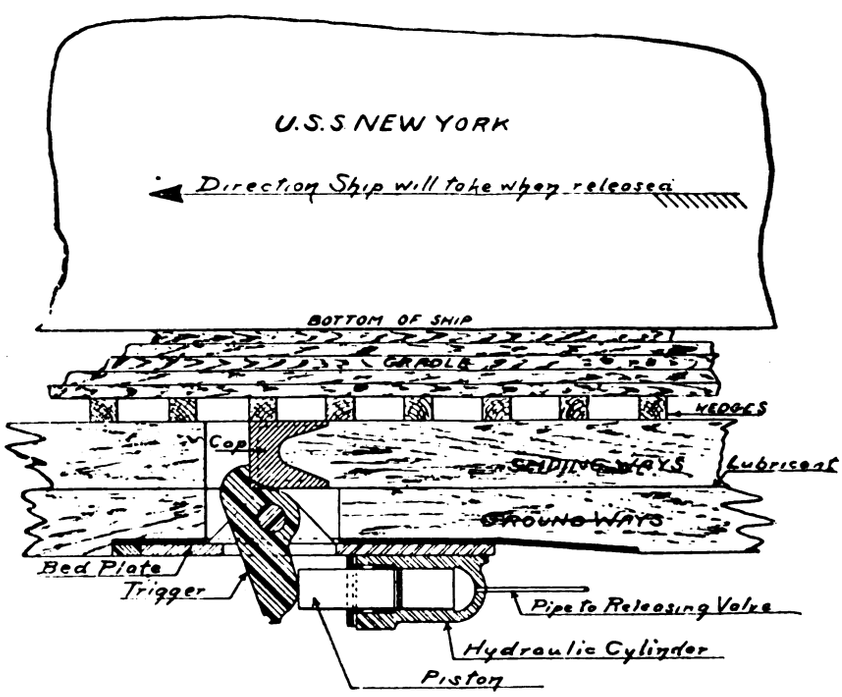

FIG. 3—HYDRAULIC RELEASING TRIGGER

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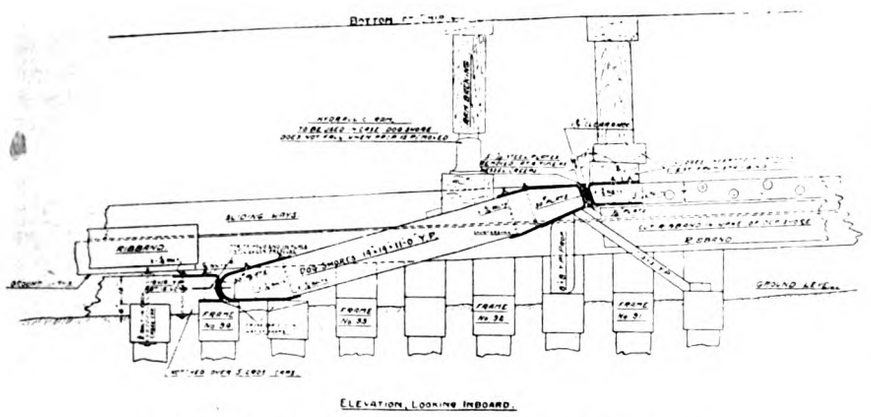


FIG. 4—ONE OF THE PRECAUTIONARY DOG SHORES

part of the dredging equipment for use in emergency work in the Culebra cut. The largest barges in the canal service at present are of 500 cubic yards capacity. The new barges are to be of heavy construction, suitable for rough service, and will be rectangular in design with a rake at each end. Each barge is to be 160 ft. long, with a molded depth of 13 ft. 6 in., and to have 30-in. freeboard when fully loaded. The hoppers are to be four in number, with a minimum width of 12 ft. at bottom, provided with doors opening to the full size, dropped by manual power and lifted by steam. The hoppers are to be provided with watertight bulkheads extending between them to the deck. The bulkheads forming the ends of the hoppers are to extend entirely across the barge frames to floor deck and side beams, made of steel plate weighing 12.7 lbs. per square foot. There is also to be a watertight bulkhead at each end of each rake, and in the space forward and aft of the hoppers there is to be a central longitudinal bulkhead of steel plate, 10.2 lbs. to the square foot, which will extend from the hoppers to each end of the barge. In addition there are to be two long lattice trusses, one on each side, midway from the center bulkhead to the side of the hull. The deck beams of 5 by 3½-in. Z-bars, spaced one on each frame. The hull plating is to weigh 22.95 lbs. per square foot.

Oil Tanker Richmond

The Fore River Ship Building Co., Quincy, Mass., launched on April 8 the oil tanker Richmond for the Standard Oil Co. of California. The vessel is built on the Isherwood longitudinal framing system to carry 2,250,000 gallons of oil in bulk, having straight stem, elliptical stern, poop, forecastle, bridge and bridge houses amidships, three steel masts with machinery located aft.

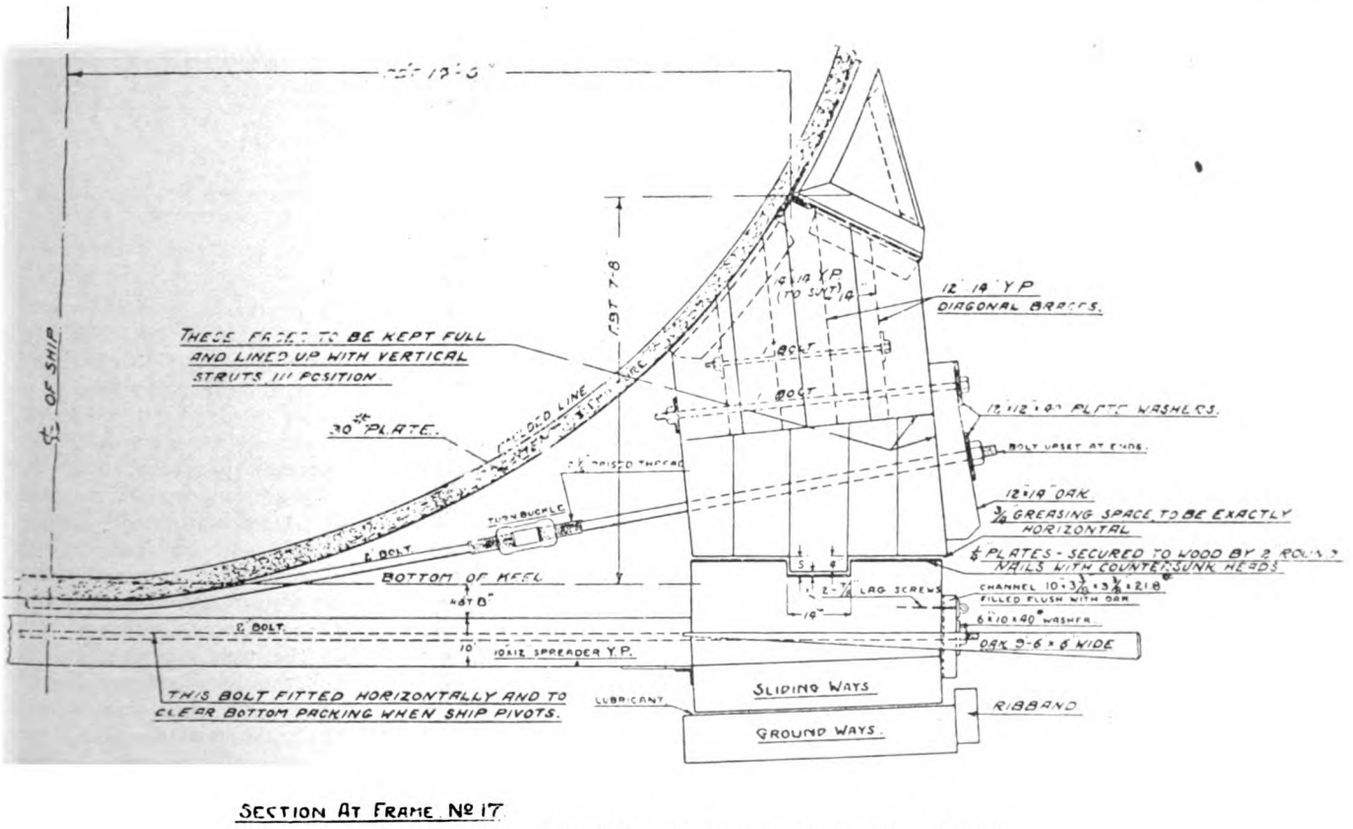
The principal dimensions are as follows:

Length over all.....435 ft.
Beam ..... 54 ft.
Depth ..... 31 ft. 6 in.

The vessel is sub-divided into sixteen tanks for oil, with pump room located forward and two tanks for oil fuel, located aft, for the use of the main propelling machinery; forward of the pump room is a large cargo hold; on the port and starboard sides of the expansion trunks are located eight summer tanks in the 'tween decks.

Captain and deck officers are berthed in the bridge house amidship; engineers, stewards, crew and firemen are housed 'tween decks in the poop.

Forward on the forecastle deck is fitted a Hyde No. 11 steam windlass aft under the poop deck is located a Hyde 10 in. and 10 in. steam steering engine with telemotor operated from the navigating bridge; there is also fitted three 9 by 12-in. horizontal single geared hoisters, to be used for cargo


THESE FACES TO BE KEPT FULL AND LINED UP WITH VERTICAL STRUTS IN POSITION
30" PLATE.
BOTTOM OF KEEL
12"x9" OAK
GREASING SPACE TO BE EXACTLY HORIZONTAL
PLATES - SECURED TO WOOD BY 2 ROWS NAILS WITH COUNTERSUNK HEADS
LAG SCREWS
CHANNEL
FILLED FLUSH WITH OAK
OAK 2'-6" x 8" WIDE
SLIDING WAYS
GROUND WAYS
RIBBAND
LUBRICANT
THIS BOLT FITTED HORIZONTALLY AND TO CLEAR BOTTOM PACKING WHEN SHIP PIVOTS.

SECTION AT FRAME No 17

FIG. 5—CROSS SECTION OF FORE POPPET AND CRADLE

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handling, warping and other purposes.

Towing arrangements aft on the poop are supplied for towing emergencies.

A continuous fore and aft bridge is fitted from the poop deck to the forecastle deck and so arranged that all the auxiliary steam and water pipes are fitted under this bridge.

A sufficient number of life boats and other boats, complying with the U. S. regulations are supplied, operated by Welin davits located on the poop and bridge decks.

The engine is a direct-acting, surface-condensing, quadruple-expansion marine type of the most modern and improved design. Four cylinders working on four cranks, cylinders are 23, 32¾, 49 and 71½ dia., 51-in. stroke, turning up not less than 85 revolutions per minute. The engine is balanced on a Yarrow-Schlick Tweedy system. Machinery is designed for a working pressure of 220 lbs. per square inch. Three boilers, 14 ft. 2 in. dia. are installed, arranged to burn fuel oil. The usual circulating pumps, air pumps, feed pumps, bilge pumps, sanitary and water service, deck pumps, etc., are supplied. On a 25-ft. draft the vessel will develop 3,000 I. H. P., steaming 11½ knots.

Torpedo Boat Destroyer Duncan

The United States torpedo boat destroyer Duncan, now under construction at the works of the Fore River Ship Building Co., Quincy, Mass., was launched on April 5. The vessel is one of eight contracted for by the United States navy in September, 1911, and is to be completed by September next.

The keel was laid in June, 1912, and she will make her first preliminary trial trip about May 15. The Duncan is 305 ft. in length, 30 ft. 6 in. in breadth, 17 ft. depth, and mean trial displacement of 1,010 tons. She carries a battery of four 4-in. guns and four 18-in. twin torpedo tubes.

The propelling machinery of 16,000 H. P. consists of two 63-in. Curtis turbines and two compound vertical reciprocating engines, giving the vessel a speed of 29 knots. The turbines are to be used for high speed and the reciprocating engines, being connected to the turbine shaft, are to be used for cruising.

Four Yarrow type watertube boilers furnish steam for the turbines and engines, at a pressure of 265 lbs. per square inch.

The vessel is built entirely of steel; all the strength members being of special high tensile steel which increases the strength of the vessel about 30 per cent over that of a similar vessel of the same weight built of ordinary steel.

The navy is giving the radio-telegraph arrangement special attention, the masts being exceptionally high to increase the range as much as possible.

Berthing and messing arrangements will be especially good for vessels of this class.

Her complement will consist of a commanding officer, four wardroom officers and a crew of 93 men, including eight chief petty officers.

Ship Building in the United States

Returns received by the Bureau of Navigation of the Department of Commerce indicate that the current fiscal year will show an output of American shipyards greater than for any of the past four years, and equal to the average annual output for any series of active years of construction. For the nine months ended March 31 the merchant vessels built in the United States and officially numbered by the department comprised 1,114 of 260,265 gross tons, compared with 1,051 of 151,341 gross tons for the corresponding nine months a year ago. As the spring and early summer are generally the season of greatest progress, the output for the year will probably reach 400,000 tons. Steel steamers built aggregate 151,507 tons, compared with 75,507 tons, for the corresponding nine months a year ago. Shipbuilding on the Great Lakes shows little change, but the total output on the Atlantic seaboard has increased from 64,522 tons to 161,061 tons. Wood sailing vessels show a decrease and form only a small fraction—11,971 tons—of the total for the United States.

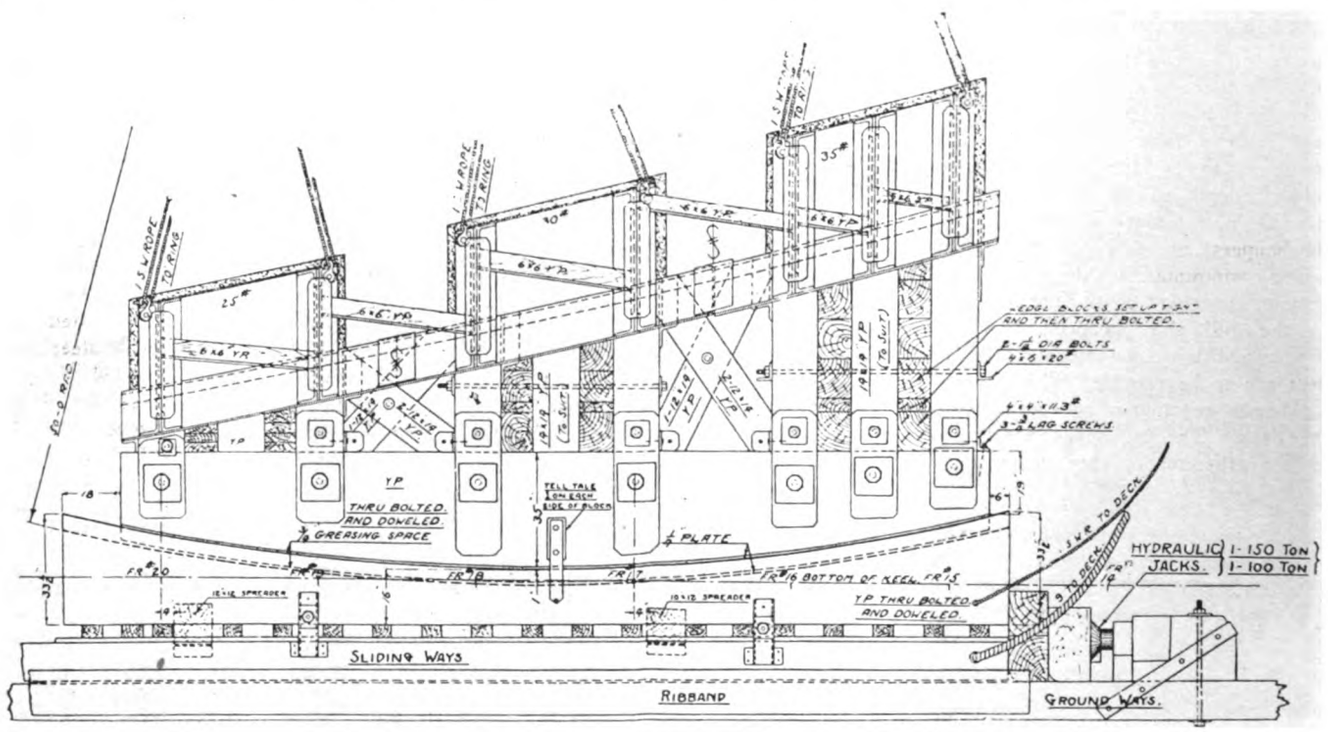

FIG. 6—ELEVATION OF FORE POPPET AND CRADLE

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Fore River Plant Sold

The Bethlehem Steel Corporation Buys the Plant Outright—No Changes in Personnel Contemplated

THE Fore River Shipbuilding Co., Quincy, Mass., has been purchased by the Bethlehem Steel Corporation. Inability to complete without further financing existing contracts which called for the construction in whole or in part of twenty-three vessels, most of them warships, involving an expenditure of about $10,000,000, is given as the reason for the sale. The transaction is a direct purchase of the physical property of the Fore River Company. The Company will be liquidated and the stockholders will receive the proceeds. The price paid was in the neighborhood of $1,250,000, which will work out about $40 per share for the preferred stock. Inasmuch as the preferred is entitled to $100 per share in liquidation, the common stockholders will receive nothing. Relative to the purchase, the Fore River Company makes the following announcement:

"The Bethlehem Company pays $600,000 in first lien and refunding 5 per cent mortgage bonds, due May 1, 1942, of the Bethlehem Steel Company. The committee is to purchase and arrange for the sale of $750,000 of first mortgage 20-year 5 per cent bonds, a lien on the present property, when and as issued by a new Massachusetts corporation, said bonds being guaranteed, principal and interest, by the Bethlehem Steel Company."

The Fore River Shipbuilding Co. was organized in 1904 to take over the old Fore River Ship & Engine Co., which had been living a somewhat precarious existence. The new company was organized with a capital stock of $2,400,000 6 per cent preferred and $2,500,000 common. The sum of $1,250,000 was paid in in cash, of which $600,000 was used to discharge demand notes issued by the old company. Since 1904, under the direction of President F. T. Bowles, formerly chief constructor of the United States Navy with rank of real admiral, the company has lived a very busy existence, and has been successful in obtaining warship contracts in competition with Great Britain, notably the battleship Rivadavia, which it is now building for the Argentine Republic.

GENERAL VIEW OF THE FORE RIVER YARD

The Fore River Company has at present twenty-three vessels in course of construction at the yard, the majority of them being warships, including one battleship, nine submarines, two torpedo boat destroyers and a tender for the United States Navy. The merchant work includes a bulk freighter for the sulphur trade, an oil tanker for the Standard Oil Co., and a few small steel trawlers for the fishing trade. It is understood to be the intention of the new owners to add a large dry dock to the equipment of the Fore River yard.

The purchase of the Fore River yard is not the first venture of Mr. Charles M. Schwab into the shipbuilding business. He organized in 1902 the United States Ship Building Co., which acquired all the stock of the old Bethlehem Steel Co., as well as the plants of the Harlan & Hollingsworth Co., Wilmington, Del., the Union Iron Works at San Francisco, and the Samuel L. Moore & Sons Co. at Elizabethport, N. J. The United States Ship Building Co. was not a success and was reorganized in 1904 by Mr. Schwab under the title of the Bethlehem Steel Corporation, taking over at the same time the properties of the Bath Iron Works and the Hyde Windlass Co. at Bath, Me., the Crescent Ship Yard at Elizabethport, N. J., the Carteret Improvement Co. at Camden, N. J., and the Eastern Ship Building Co. at New London, Conn. The properties of the Bath Iron Works and the Hyde Windlass Co. were soon sold. The plant of the Eastern Ship Building Co. was practically dismantled, and the Crescent Ship Yard and Carteret Improvement Co. were merged into the Samuel L. Moore & Sons Co. The only subsidiaries that remained in working form were the Harlan & Hollingsworth Co., the Union Iron Works and Samuel L. Moore & Sons Co. In 1908 the Union Iron Works took over the plant of the San Francisco Dry Dock Co. and has operated it since.

The authorized capital stock of the Bethlehem Steel Corporation is $30,000,000, equally divided between preferred and common. The preferred stock is 7 per cent non-accumulative and has a preference as to assets. Since 1907, however, no dividends have been paid on the stock. In this connection it is interesting to note that the Bethlehem Steel Corporation contemplates building ten ore carriers to carry ore from new mines in Chile which are owned by the Bethlehem Steel Corporation. It also owns iron mines in Cuba, all of which calls for the employment of vessels.

The Bethlehem Steel Corporation is at present furnishing the Fore River plant with the armor and armament of the Argentine battleship Rivadavia, and it would seem as though the acquisition of this yard would put it into a favorable position to build warships complete for any world power.

Mr. Schwab has announced his intention of retaining Admiral F. T. Bowles as president of the yard, together with his present staff.

Lt. Col. M. Eveleth Winslow, government engineer at Norfolk, Va., will open bids June 2 for the construction of three motor survey cruisers.

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WITH THE LEGISLATORS

SENATOR Chamberlain, of Oregon, has introduced in the senate a resolution to abrogate the Hay-Pauncefote treaty upon the terms of which Great Britain bases her protest against the Panama canal act. He also includes the Clayton-Bulwer treaty in his resolution, though the Hay-Pauncefote treaty superseded it, his motive in this particular being to prevent any subsequent claim on the part of Great Britain that the Clayton-Bulwer treaty automatically revives upon the abrogation of the treaty supplanting it.

The sentiment in favor of the abrogation of the treaty appears to be quite general. *The Washington Post,* always a very conservative journal, comes out flatly in favor of the abrogation of the treaty, saying: "Unless Great Britain can bring new reasons to bear in support of her position, stronger and more conclusive reasons than any yet advanced, the treaty should be abrogated, and Great Britain, if she is a real friend of the United States, will consent to the abrogation."

Abrogation of the Treaty

The gist of Senator Chamberlain's resolution is contained in the following paragraph:

"Whereas, the United States at great expense and without any question as to her power, authority or rights, has constructed a canal across the Isthmus of Panama on territory over which she has so an exclusive a jurisdiction and authority and has enacted a law for the use of said canal by her own people as well as by other nations in strict conformity with her duties and obligations to all the maritime powers of the earth and after the enactment of said law, but before the president's proclamation fixing the canal tolls Great Britain entered her form of protest against said act as violative of the treaty of Nov. 18, 1901, and in particular through that portion of the act granting free tolls to American vessels engaged in coastwise shipping, which was purely a domestic concern, and

"Whereas, in said note of protest it is suggested that there are other provisions in said act to which Great Britain may later feel constrained to enter protest, claiming that they are violative of said treaty, particularly that part of said act which forbids the passage through said canal of railroad-owned ships which provision is intended for the protection of the internal commerce of the United States.

Remission of Tolls

"Now, therefore, in order that the views of the congress of the United States may be understood and room for future protest and objection on the part of Great Britain removed, be it

"Resolved, that the United States are of right freed and exonerated from each and all of the stipulations of said treaty of April 19, 1850, commonly known as the Clayton-Bulwer treaty, and from each and all of the stipulations of said treaty of Nov. 18, 1901, known as the Hay-Pauncefote treaty, heretofore concluded between the United States and Great Britain, and that the same shall not, nor shall either of them nor any of the stipulations in either thereof contained henceforth be regarded as legally obligatory upon the government or citizens of the United States." The resolution has been referred to the committee on foreign relations.

Discussing the resolution, Senator Chamberlain said: "If Great Britain is to protest step by step against our canal legislation, then we may as well go at once to the agreement upon which she bases her protest and nullify it."

Senator Chamberlain is convinced that Great Britain's protest against the remission of tolls to American shipping is supported and inspired by the Canadian trunk lines and that they are aided and abetted by the American trans-continental railroads, which are naturally opposed to the provision excluding railroad-owned ships from the use of the canal.

One of the worst features of the Hay-Pauncefote treaty is the fact that it prevents the United States from regulating its own commerce in its own way. It is no longer a reciprocal measure, but one which operates exclusively to the advantage of Great Britain.

Senator Chamberlain is insistent upon saying that Great Britain has no case whatever and that it would not have protested against the Panama canal act had it not been for the activity of Anglomaniacs in the United States. In this class he puts Senator Root and blames him most of all for the present unpleasant situation. He also believes that Great Britain was quite hasty in framing its protest and did so without full knowledge of the facts. In fact, there is much in Sir Edward Gray's note to Secretary Knox to sustain this contention, because it is quite clear from a perusal of that note that Sir Edward Gray did not understand that coastwise shipping is reserved exclusively to American ships. Concluding his discussion of the resolution, Senator Chamberlain says:

Too Many Anglomaniacs

"We have had too many Anglomaniacs in this country coming to the support of the British view. If we yield on one phase of the case we shall be called upon to yield on others. England says so, frankly. If we accede to the British demands regarding our right to exempt our coastwise ships, then Great Britain will protest that provision which prohibits the use of the canal to railroad-owned steamships. This is of equal importance to the country, as it is through this prohibition that we will control our own internal commerce.

"Wipe that proviso from the canal act and the steamships of the Canadian railroads will sail through the canal from Atlantic ports to Victoria and absolutely dictate what the rates of the railroads will be. The community of interests between the American and the

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Canadian railroads will indicate exactly what sort of a dictation that would be.

"It is high time for an illuminating discussion of this whole question. There may be a good many people who blindly accept what they have heard and who may be led to believe that this government is not living up to its solemn pledges. Let us get all the facts before them, so they will understand the situation.

"The pro-British side has been too long before the people unchallenged. A discussion of this resolution I propose to offer will do the country good, for it will expose the fallacy of much that has been spoken and written in advocacy of the British contention."

Congressman J. Hampton Moore, of Pennsylvania, followed Senator Chamberlain's resolution with a bill directing the secretary of state to confer with Great Britain and other nations with the view of having them participate in the cost of construction and maintenance of the canal. Mr. Moore suggests that, as the canal will cost the American people about $400,000,000 and the maintenance thereafter will amount to about $25,000,000 annually, it would be fair if other nations object to the United States giving its own vessels a preference in the use of the canal. By bearing a fair proportion of the expense, he contends, other nations would come in on equal terms with this country. This will avoid the necessity of fortifications, he argues, the joint ownership assuring peace. All controversies with regard to treaties and tolls can be adjusted satisfactorily and expeditiously, he says, if other nations who want to use the canal join in the expense.

Mr. Moore also offered a bill providing for the creation of a Panama canal commission to aid the interests of this country and to repeal that part of the Panama government act admitting free of duty materials of foreign production that enter into the construction or equipment of ships.

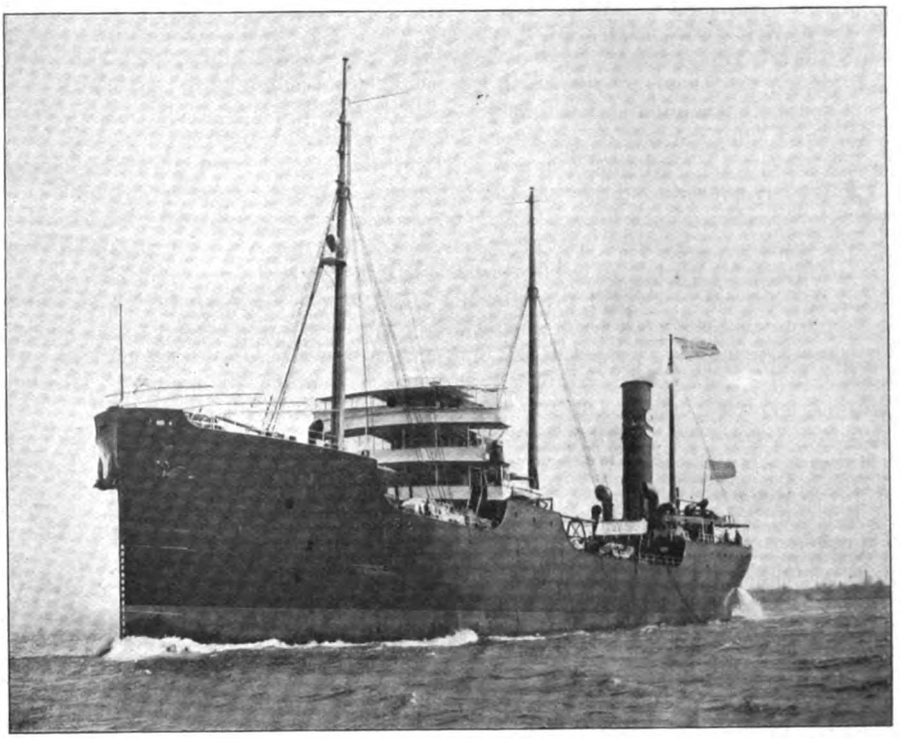
Significant action was taken by the Senate Interoceanic Canals Committee when by a vote of 13 to 1 it decided to postpone action on the Panama tolls until the regular session of congress in December next. The action seems to foreshadow a positive refusal by the senate to repeal the legislation giving free passage through the canal to American coastwise shipping. If Colonel Goethal's hopes are realized the canal will be opened to shipping before December.

The Underwood tariff bill contains the following provision:

"That a discount of 5 per centum on all duties imposed by this act shall be allowed on such goods, wares and merchandise as shall be imported in vessels built in the United States and which shall be wholly the property of a citizen or citizens thereof." This provision will have some influence upon importations from Europe, but would be of slight benefit in stimulating the carriage of goods from South America in American ships, as practically all of our imports from South America are on the free list.

Oil Tanker Vesta

The oil tanker Vesta, which has been changed into an oil-burning steamer at the yard of the New York Ship Building Co., Camden, N. J., underwent its trial trip on the Delaware river recently, meeting all requirements. The trip was in charge of George M. Andrews, general manager of the New York Ship Building Co., and W. G. Randle, marine superintendent. D. E. Ford represented the Standard Oil Co.



OIL TANKER VESTA, BUILT BY NEW YORK SHIP BUILDING CO. ON HER TRIAL TRIP

Bucket Dredger Charles Harrison

Messrs. William Simons & Co., Ltd., of Renfrew, launched last month, with all machinery on board and steam up ready for work, the barge-loading bucket dredger Charles Harrison, built by them to the order of the North Eastern Railway Co. The vessel, which has been specially designed for dock work, is of the bow-well bucket ladder type and is well equipped for dealing with all classes of material and is capable of dredging to a depth of 35 ft. below water level. A set of compound marine type engines supplied by steam from a multitubular steel boiler constructed for a working pressure of 120 pounds drives the dredging machinery. The deck machinery includes steam gear for raising and lowering the bucket ladder; powerful bow and stern winches for maneuvering purposes and for regulating the cut of dredger while at work. Comfortable cabins are provided for the officers and crew. The dredger is built to Lloyds Survey and was constructed under the direction of Charles Watson, engineer to the North Eastern Railway Co., Newcastle-on-Tyne.

Earnings of Three Steamship Lines

The revenues of the Cunard Steamship Co., increased from $14,974,943 to $17,457,527 in 1912, an increase of $2,482,584. This is a gain of 16.6 per cent. Operating expenses increased $825,491., or 7.5 per cent, the total for 1912 being $11,836,011. The net earnings amounted to $5,621,516, an increase of $1,657,093.

The North German Lloyd's gross revenues were $12,341,121, as against $9,887,404 for the preceding year, an increase of $2,453,717.

The Hamburg-American Line reports net revenues of $13,522,275, a gain of $2,260,073.

"Microbes is so shmall," says Pat, "ye cud put a handful of 'em on the point of a needle."

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Design of Oil Steamers*

A Review of the Structural Features of Tank Vessels Engaged in Oversea Trade

By James Montgomery

Concluded from April Issue.

IF this paper had been written five years ago, my remarks on this division of the subject would have ended with the close of the previous sentence. In that time, however, Mr. Isherwood had produced his longitudinal designs, and these, particularly in regard to oil vessels, have been widely adopted, as will be evident from the fact that not less than 76 per cent of the number of oil vessels now building are on the longitudinal system. Amongst these are the largest ships that have yet been built for this trade, and Figs. 10 to 22, are interesting as showing not only the general principles of Mr. Isherwood's designs, but the detailed scantlings of a steamer 525 ft. in length, 66 ft. in breadth molded, and 34 ft. in depth molded. It is of the shelter-deck type, and contains 12 oil tanks situated below the upper deck, 10 of these being 22 ft. 6 in. in length, and two 28 ft. Oil fuel is carried in a tank in the boiler room (the machinery is placed aft) and in a deep tank forward. The distinguishing features of the systems are the same here as in ordinary longitudinal cargo ships, and as they are now widely known, I need not go into them in detail. Deep transverses are fitted between the bulkheads, supporting the deck, sides and bottom, while the shell and deck plating is locally stiffened by the longitudinal girders. These latter are cut at the bulkheads, and are worked in association with the horizontal stiffeners on the bulkheads, to which they are attached by brackets. One transverse is fitted in each of the 22-ft. 6-in. tanks, and two in those 28 ft. in length.

Comparison of Systems

Without venturing on a detailed comparison between the transverse and longitudinal systems as applied to oil vessels, I may be permitted to make one or two observations on the latter. The first is that the two characteristics which have been held as essential in the hull construction of an oil ship are secured here also. The girders which actually support the loads on the decks, sides and bottom are designed of a very deep, stiff nature. These girders also and the intermediate bulb angle stiffeners are continuous, making possible rigid attachments at their ends. Again, it may be pointed out that the theoretical objection which one frequently heard urged against longitudinal vessels when they were first introduced, to the effect that they did not offer sufficient resistance to racking stresses, certainly does not apply here. The transverse strength of the vessels shown in the drawings reproduced, made up as it is by bulkheads closely spaced, and webs, is, at least, equal to that obtained in the transverse system. Further, it may be held that the longitudinal system, as a system of construction, can be employed more advantageously in oil vessels than in the majority of other types of cargo steamers.

Compression Forces

I think it is not generally realized that, owing to the distribution of weight in a fully-laden tanker, with machinery aft, the maximum bending moment occurs in the sagging condition, in opposition to that found in the case of an ordinary cargo vessel with machinery amidships, where the maximum is generally found in the hogging condition. The maximum structural stresses, although they may be the same quantitatively, are more severe because reversed in direction, and they represent in oil ships a state of compression in the topside materials.

It is well known how difficult it is to provide against compressive forces in the deck plating, and that the only effective provision is the fitting of intercostal girders, which stiffen the deck plating locally between the beams. I need hardly insist on the effectiveness of the shelter deck plating to resist compression in the vessels shown in Figs. 10 to 22, in respect of the number and dimensions of its longitudinal supports.

I may draw attention to an inference of practical value derived from a consideration of the above. When oil of a high specific gravity is carried, it is sometimes unavoidable that one tank should be empty, and since the maximum stresses are in the sagging condition, the empty tank should be situated amidships, and not at the ends.

The scantlings of the transverses, longitudinals, etc., are determined, for the most part, on local considerations. A certain condition is assumed, and the same stress (or as near to that as possible) is worked to in each case for each set of girders. The condition generally assumed is a load represented by a head of water to the upper deck, and under this and other assumed conditions the resultant stresses in the various parts are as shown in Table I, the girder being taken as fixed at the ends, and the effective length being taken to the middle of each bracket.

Table I.

Item—Load.	Stress.*
Bottom transverses, Head of water to upper deck	4.25
Side transverses, Head of water to upper deck	3.46
Upper-deck transverses, 10 ft. head of water	3.40
Shelter-deck transverses; As in ordinary cargo ships	4.80
Webs on transverse bulkheads; Head to upper deck	5.00
Webs on longitudinal bulkheads; Head to upper deck	4.80
Bottom longitudinals; Head to upper deck	2.80
Side longitudinals below second deck; Head to upper deck	6.00
Upper deck longitudinal; 10 ft. head of water	5.40
Longitudinals on transverse bulkheads; Head to upper deck	4.20

*The stress units are inches and tons.

In connection with the foregoing, some theoretical objection may be raised to the practice of determining the scantlings of structural parts on local considerations, but it does not appear that such objections are of much weight if the method be judiciously applied. It is, in fact, the only practical method at the present stage. If a collection of scantlings were at one's disposal, derived from the results of experience over a sufficiently long period of time, and from a sufficiently large and varied number of cases, it would be easy to frame rules which would take account of all the principal factors. Take, for example, the case of the bottom longitudinals. If one knew the scantlings which had been proved to be suitable from a number of representative cases, these could be expressed graphically by a curve, the ordinates of which might be the longitudinal number of the vessel and the ab-

*Paper read before the Institution of Engineers and Ship Builders in Scotland on Jan. 21.

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Fig. 10.

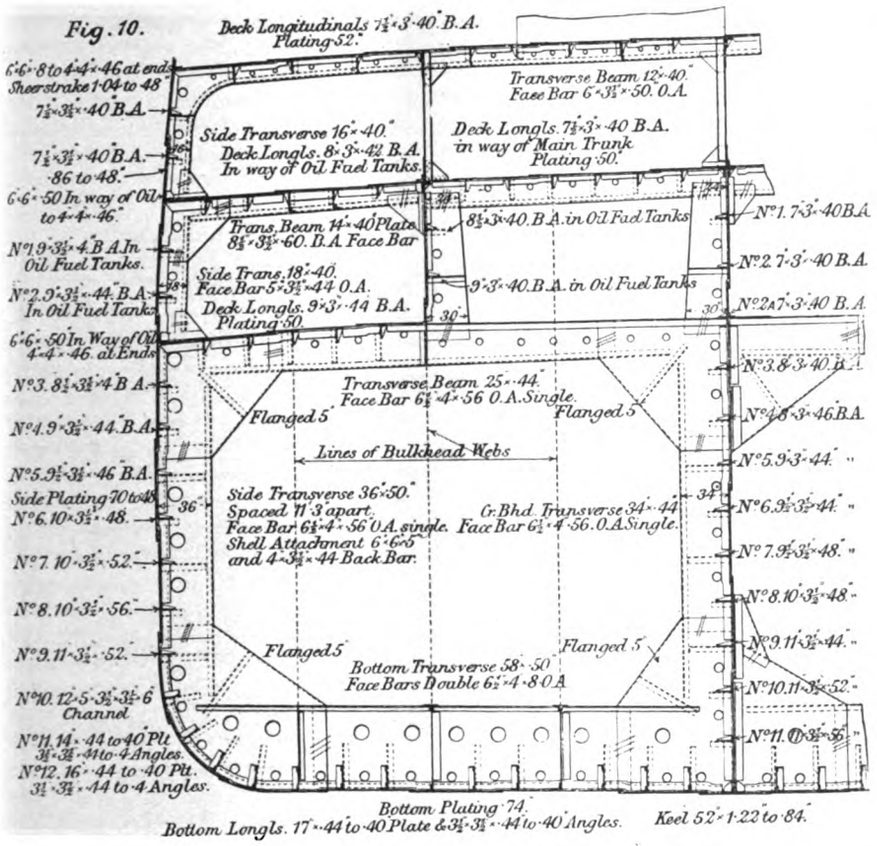

Fig. 11.

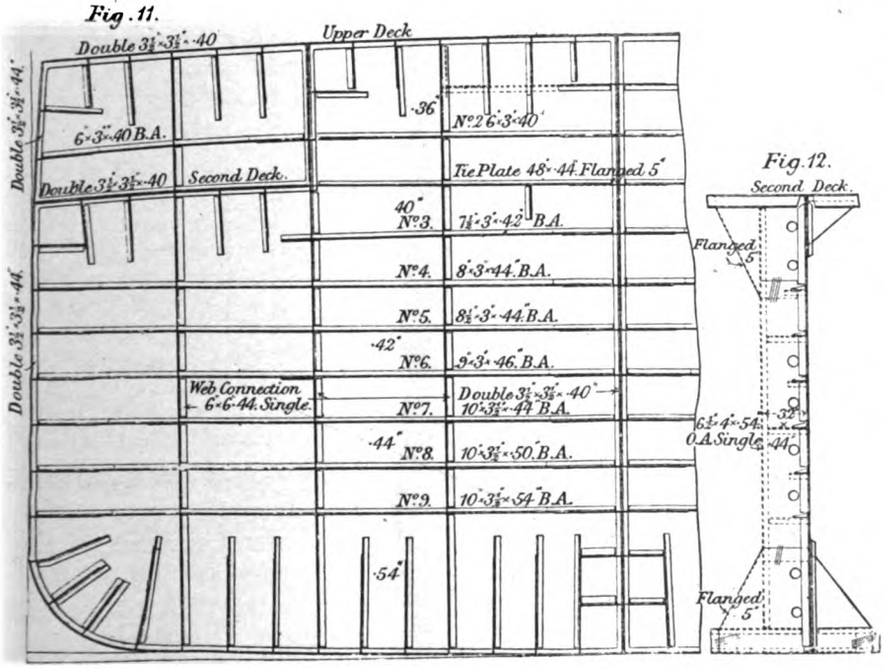

Fig. 12.

scissae a number of the dimensions of a simple bending moment. But these scantlings not being available at present, one is forced to the employment of a simple stress basis as being the next best thing. It should be remembered, however, that the method is approximate and partial, and does not take into account some important factors. For example, the longitudinals which are cut at the bulkheads and extend through the transverses are treated as so many beams fixed at their ends and of a certain length. But they are really continuous beams with one or two intermediate supports, and the above assumption really implies the perfect rigidity and consequent zero deflection of these supports. Even a small deflection there, however, will make a sensible difference in the result. Taking the longitudinals on the side below the tank deck, and allowing for a deflection of 1/30 in. under test (a very small deflection, and one based on the observed result of an actual case) the variation of stress from that found on the former assumption is clearly shown in Fig. 23. By basing the size of the longitudinals on depth alone, neither the effect of any slight deflection of the transverse, nor the effect, more important perhaps, of longitudinal bending has been specifically taken into account. If the simple stress method for the determination of scantlings be applied judiciously, we shall not ignore either of these; but the fact will be duly recognized that, as will be seen from the curve, they tend in this instance to neutralize one another, since, as the stress due to longitudinal bending increases, that due to the deflection of the transverse is reduced.

Erecting, Riveting, Etc.

The process of erection in the case of a transverse ship is obviously somewhat different from that adopted in the case of longitudinal vessels. In the former case the form of the hull is defined by a series of bulkheads and closely-spaced transverse frames, which are faired in their true positions by horizontal ribbands, each of which is marked for the position of the frames. In the latter case the form of the vessel is first determined by the bulkheads and transverses when placed in position. These are generally faired by two ribbands, one at the lower turn of the bilge and one in the vicinity of the second deck. The longitudinals are then placed in position between the bulkheads, and the fairness of the ship as a whole depends upon the fairness of the bulkheads and transverses, and between these upon the longitudinals being true to set. The position of the longitudinals can be adjusted slightly at the points of attachment to the transverse members, but, as before stated, their fairness between these points depends mainly on the accuracy of the work done previous to erection. The work of preparing and erecting a longitudinal ship therefore demands more skill and care than in the transverse system, particularly at the ends of the vessel; and in order to minimize and simplify the preliminary work as far as possible in some cases the second or tank deck has been made parallel to the keel fore and aft.

The process of erecting depends to a large extent upon the amount of riveting that can be done on the ground, and it is highly desirable that this should be a maximum. The efficiency of all oil vessels depends pre-

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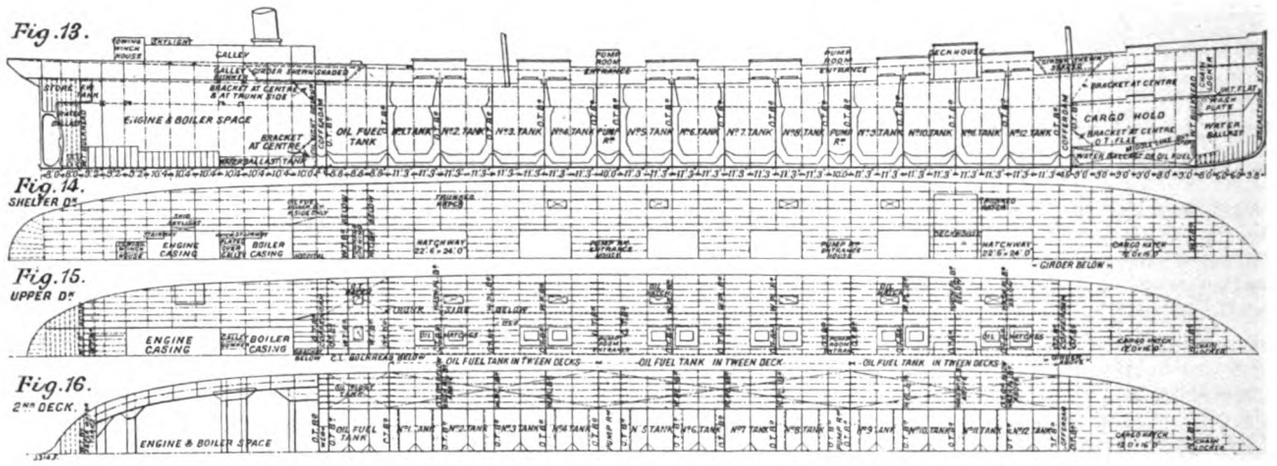
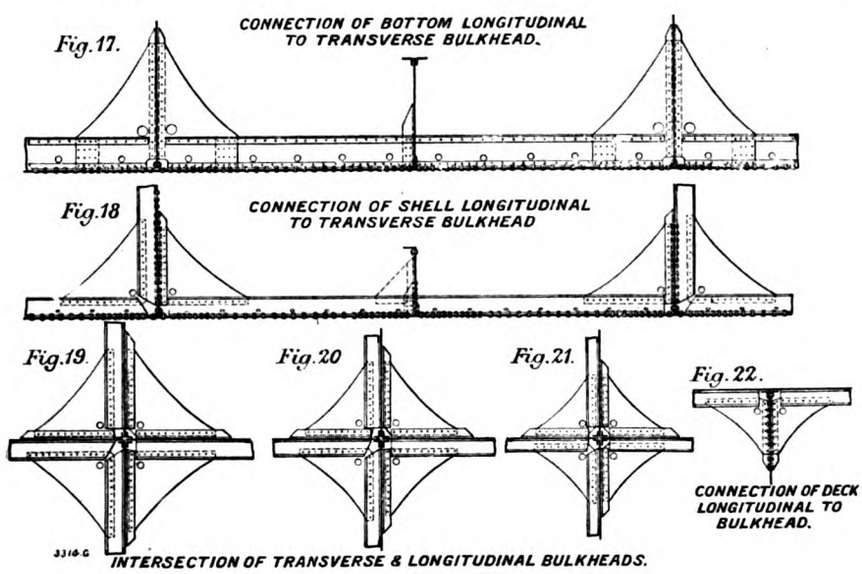
eminently, as records of damage prove, upon the efficiency of the riveting, and one need scarcely labor the point that riveting done on the skids is very much to be preferred in point of efficiency to that done on stages by hand after erection, circumstances permitting in many instances single-handed work only. The amount of riveting done prior to erection will depend, among other things, on the lifting appliances available. The floors and wing plates of the transverse bulkheads should, if possible, be prepared and lifted in one piece with the angles for the bracket attachments of the longitudinals in position and riveted and calked. The shell connection angles on the floor and wing plate are also riveted and calked. At the intersection of the transverse and middle-line bulkheads a "cruciform" section is often adopted in both transverse and longitudinal vessels. The plates forming this can be fitted in four seperate pieces (see Figs. 25 to 27), so as to make hydraulic riveting possible, and, at the same time to keep the adjacent vertical landings clear of the outer extremeties of the brackets, thus facilitating oil-tight work. On this cross piece also the bracket angles for the longitudinals are riveted and calked. The transverse and fore and aft plating of the transverse and middle-line bulkheads respectively have the horizontal stiffeners riveted to them, and are lifted into position in a lift of one or two tiers of plates as facilities may offer. The above procedure demands fairly good lifting facilities,





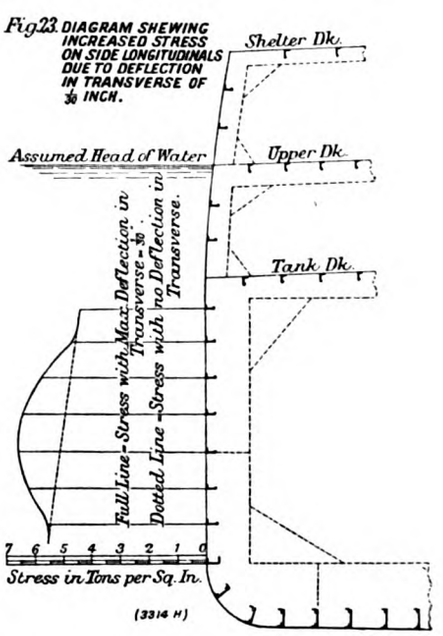
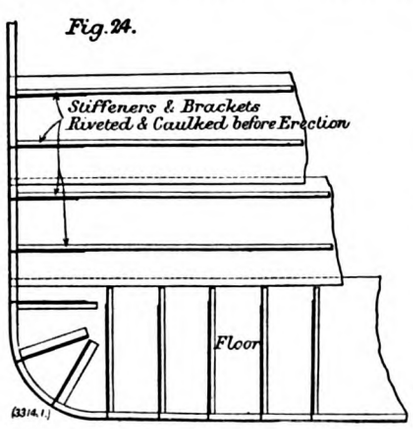
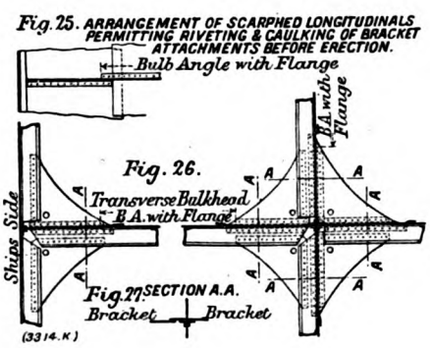
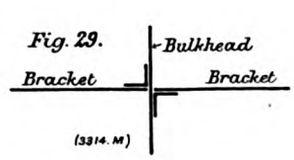


Fig.23. DIAGRAM SHEWING INCREASED STRESS ON SIDE LONGITUDINALS DUE TO DEFLECTION IN TRANSVERSE OF 1/30 INCH.
Shelter Dk.
Assumed Head of Water
Upper Dk.
Tank Dk.
Full Line - Stress with Max. Deflection in Transverse = 1/30
Dotted Line - Stress with no Deflection in Transverse.
7 6 5 4 3 2 1 0
Stress in Tons per Sq. In.
(3314 H)







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but the advantages following upon it are apparent. All, or nearly all, the riveting and calking of the three-ply work at the sides and center are done on the ground instead of in the vessel, and by hydraulic riveting instead of riveting by hand. When the arrangements of the yard do not permit of this being done the bulkheads may be prepared and erected in another manner to achieve the same end. The bulkhead may be plated entirely horizontally, and each strake of plating prepared independently with two horizontal stiffeners attached to it and lifted into place (see Fig. 24). Here, again, the riveting of stiffeners and three-ply work at the sides and center can be completed before erection, with results which will be appreciated when the tanks come to be tested. The bracket attachment angles at the center and sides in transverse ships are calked right round on both sides of the bulkhead, and in longitudinal vessels the best practice is to calk both heel and toe of the bars. This is necessary, or desirable, for if one side only be calked and the tank found tight under test when the test comes to be applied from the opposite side a slight leak has been found to occur at these attachments, which is troublesome to deal with.

Work Done Prior to Erection

In connection with the foregoing, I may say that I was impressed when in America last year with the amount of work done upon the material on the ground prior to erection, and with the extent and thoroughness of the work done in the drawing office and molding loft. This was especially the case in the manner of dealing with longitudinal vessels; he preliminary work necessary in these ships appeared to suit established practice. The lifting appliances are very good, in one case the transverse bulkheads of a small oil vessel being completed on the ground and lifted into place.

Another expedient adopted in longitudinal ships to get as much riveting at the sides and centers done on the ground may be mentioned here. A glance at Fig. 29 will show the stiffeners on the transverse and longitudinal bulkheads and their attachment to each other and to the shell longitudinals. Instead of extending the longitudinal intact to the side of the vessel, the 3½-in. flange is cut off from the inner edge of the bracket, and the connection made to the bulkhead by a short length of angle riveted to the horizontal flange of the bulb angle. This angle scarphs the 3½-in. flange of the bulb angle to avoid discontinuity. The angle can be riveted to the wing plates and calked on the ground, and, when erected, is in position to take the bulb angle stiffeners.

Unlike the transverse oil ship, the bracket attachment angles in longitudinal vessels have unequal flanges, these being 4 in. by 3½ in. instead of 3½ by 3½ in., as in the former case. In the best practice, as before stated, these angles are calked all round, and the 4-in. flange allows room to calk the heel effectively, the edge of the bracket plate being stopped short of the same.

Placing of Longitudinals

After the bulkheads and transverses are in place and faired, the longitudinals are placed in position. These have to take the bracket connections at the bulkheads and the slots in the transverses. It facilitates and cheapens the construction if the longitudinals have the end brackets riveted to them before erection.

But in general it is not possible to do this unless some special device be adopted. The double shell angles on the bulkheads prevent the longitudinal with bracket attached being square into position. An expedient which does not involve any increase of weight or labor, and at the same time allows the brackets to be riveted to the longitudinal before erection, consists in making the attachment bars on the bulkheads of angles 8 in. by 3½ in. (see Fig. 28). The brackets then lap 3½ in. on the 8-in. flange, the excess weight of the lugs is balanced by the saving on the bracket, and the longitudinals can be completed on the ground and lifted in place with brackets attached, clearing the bulkhead shell bars without difficulty. The same device can be adopted, I need hardly say, in respect of the fitting of the deck longitudinals.

Although the practical difficulty of three-ply work is largely got over by the use of hydraulic riveting, yet it should be avoided whenever it is possible to do so without impairing efficiency. It should not be avoided by simply reversing the second bar, as in Fig. 29, as the rivets in the connection then pull on the bulkhead plating alone. In transverse ships, in order to increase the amount of two-ply work and to facilitate the use of hydraulic riveting, it has recently become usual to effect the connections of the side stringers and side keelsons to the bulkheads, and the connections of the floor to the center-line bulkhead, etc., by means of T-bars, the widths of the flanges of which are 6½ in. by 6½ in. Figs. 30 to 37 show these connections made in this manner, the T-bars being, of course, riveted to the bulkhead wing plates, etc., and calked on the ground. This method of connection is a great improvement on the practice of getting double bars.

The remarks just made lead naturally to the question of the number of rivets proper to any given connection, and to the forms of rivets generally used in oil work. In shipbuilding practice the number of rivets in bracket connections is almost exclusively determined by practical experience, and in some of the earlier oil ships the number of rivets in the connections of the stringers and keelsons to bulkheads was so reduced that no relation of equality was obtained between the efficiency of the joint and the strength of the girder itself. It is desirable, therefore, to find some rational basis upon which to work or to put some check on rules, for the most part arbitrary.

Number and Form of Rivets

The following method, which is suggested for consideration as a means of determining approximately the number of rivets necessary in a given end attachment, depends primarily on the assumptions that the critical loading for the girder is that which induces maximum stress in the rivet farthest removed from the heel of the bracket—an assumption the validity of which is established by the greatest majority of cases of damage. It is also assumed that, in that case, the rivets effective in resisting deformation are, for all practical purposes, the rivets in the brackets alone, that the sheer force at the end is uniformly distributed over these rivets, and that the stress in the rivets due to the bending moment varies directly as the distance of the rivet from the heel of the bracket. The units being inches and tons, let

W be the shear force at the ends of girder under any assumed conditions.

M be the bending couple at end.

n be the number of rivets in each arm of the bracket.

a be the area of each rivet.

d be the spacing of rivets from center to center.

Then the shear stress on each rivet $= \frac{W}{n\,a} = q$.

Let p_1 be the stress due to the bending moment on the rivet farthest from the heel of the bracket:—

Then the stress on the adjacent rivet will be $p_1 \frac{n-2}{n-1}$

The sum of the moments of the

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rivets taken about the rivet nearest the heel of bracket will be.

$$\frac{p_1}{n-1}\left[(n-1)^2+(n-2)^2+(n-3)^2+\right]d.a.$$

and if this be equated to the end couple,

$$p_1 = \frac{(n-1)\,M}{[(n-1)^2+(n-2)^2+(n-3)^2+]\,d.a.};$$

p, and q may be compounded, giving a maximum principal stress p—such that

$$2p = \frac{(n-1)\,M}{[S^2]\,d.a.} + \sqrt{\left\{\frac{(n-1)\,M}{[S^2]\,d.a.}\right\}^2 + 4q^2}$$

where

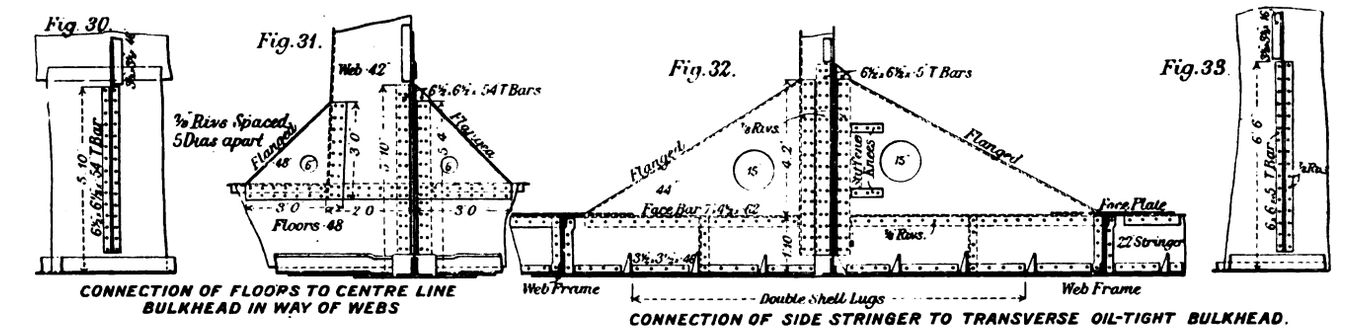
$$S^2 = [(n-1)^2+(n-2)^2+] = \frac{n}{6}(2n^2-3n+1).$$

The above method, I need hardly say, gives only approximate results; but it may be sometimes usefully employed in checking the number of rivets actually fitted in any given case The final stress found should be related in a comparative sense to the stress provided for in the girder itself. In using it, it is necessary to bear in mind that it takes account of the external loads only, and the result obtained may in some cases be increased considerably due to structural straining action.

As a practical example, it has been applied to the connection of longitudinal No. 6 to the bulkheads (see Figs. 10 and 11. The result of the method is expressed graphically in Fig. 38, the maximum stress being 4 tons per sq. in. The stress in the girder itself under the conditions assumed is 6 tons per sq. in. It is sometimes proposed to make such a connection by means of the same number of rivets in a smaller bracket, double-riveted in each arm. Fig. 39 shows the effect of making such an economy in the material of the bracket. The same number of rivets is fitted, but the maximum stress has been increased 70 per cent. I should add that Mr. Isherwood has always been alive to the importance of this in the preparations of his designs.

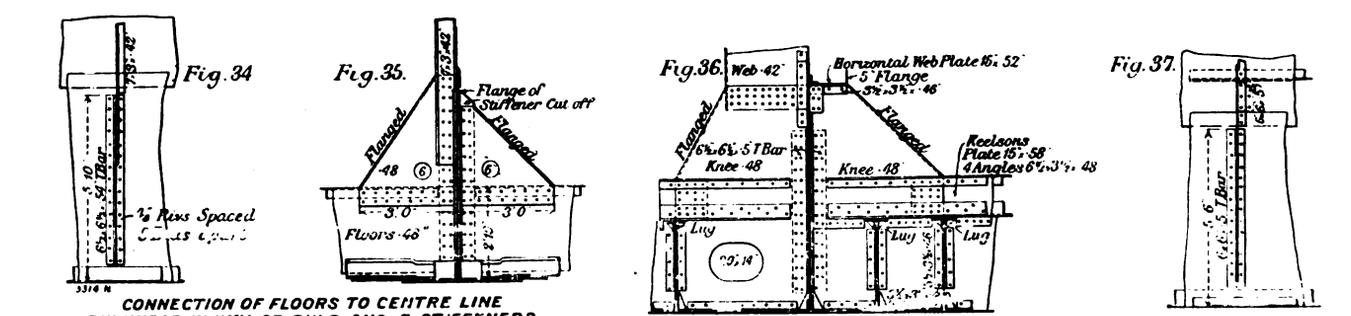
pan-headed rivets with swollen necks, and rivets with raised countersunk heads. The use of these, as stated, differs in different districts and in different yards. On the Clyde the hydraulic riveting on the bulkhead wing plates, including the riveting of the bulkhead frames to the same, the bracket connections, angles and three-ply work generally, is done with pan-headed rivets, the hydraulic tool finishing these with snap-head and point. Sometimes also the riveting of the keel angles, keel and vertical keelson, the butts of the center keelson, and the riveting of the longitudinal girders to the latter, is also done in this way.

I may mention that, as a rule, it is advisable to arrange for the hydraulic or other riveting done prior to erection to be done on the surfaces which are to be ultimately oil tight. For example, in Figs. 10 to



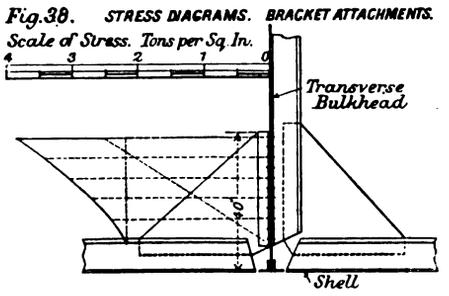
CONNECTION OF FLOORS TO CENTRE LINE BULKHEAD IN WAY OF WEBS

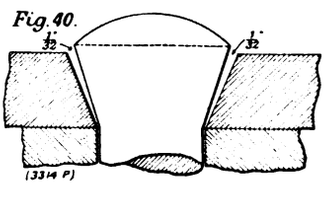
CONNECTION OF SIDE STRINGER TO TRANSVERSE OIL-TIGHT BULKHEAD.

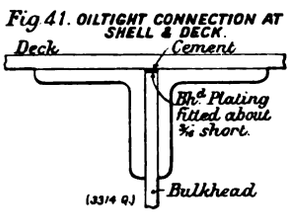


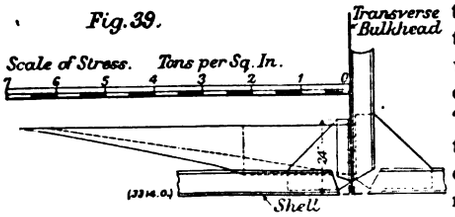
CONNECTION OF FLOORS TO CENTRE LINE BULKHEAD IN WAY OF BULB ANGLE STIFFENERS

CONNECTION OF SIDE KEELSONS TO TRANSVERSE OIL-TIGHT BULKHEAD.









As regards the form of rivet employed in different parts of the structure, this varies much in different districts. In the paper on "Oil Ships", written by Mr. Martell, in 1893, he condemned the use of what he calls "plug-headed" rivets, and alludes to the poor results obtained in many cases from their use. The bulk of the rivets used in oil ships are ordinary

12, in the case of the connections of the transverses to the center keelson, it is optional whether these connections be riveted to the transverse before erection or to the center keelson. It is desirable, however, that the latter course be followed, when the work on the oil tight surface can be made as perfect as possible, and any subsequent necessary adjustment

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is done on parts that are not oil tight. Rivets with countersunk heads are chiefly used in the bulkhead frames through the shell and through the bulkhead when done by hand, also in bulkhead deck bars through deck and through bulkhead when done by hand, in all collars, and generally in three-ply work when hand riveted. It is not usual to calk the heads and points of the rivets in the bulkhead connections just referred to, but it is sometimes done. For two-ply work in shell, bulkheads, decks and trunks, rivets with pan-heads are used.

On the northeast coast again it is usual in hydraulic riveting the wing parts of the bulkheads on the skids to use countersunk rivets with raised heads, the machine leaving them with snap heads and points. If hand riveting be employed, the same type of rivet is used. For the riveting of bulkhead bars to deck, also the riveting of the trunk sides, and generally for countersunk work in light thicknesses, excluding the shell, it is customary to use rivets with flat countersunk heads.

Pneumatic riveting has been adopted with advantage in oil-ships at those parts where accessibility for efficient hand riveting cannot be obtained, as at the bilges of longitudinal ships, for example, for the bracket attachments of those longitudinals which converge on the bulkhead. The rivets have pan heads and are finished off with a boiler point. The principal precaution to be observed in pneumatic riveting is to see that there is plenty of length in the shank of the rivet. If this be not done, the point of the pneumatic tool bears on the plate before the rivet completely fills the hole, and in the final stages of the operation energy is being expended on the surface of the plate instead of upon the rivet.

Operation of Riveting

The actual operation of riveting is of great importance. Mr. Eldridge, in a paper read before another technical society, said that, in his opinion, the secret of satisfactory results in oil-vessels was principally a matter of local connections and sound riveting, which should approximate to the standard of boiler work. Attention should be principally directed to securing holes as fair as possible, to removing all unfairness by rimering, and not by drifting, and to seeing that the points of the rivets are left full. The spacing of the rivets in the different parts of the vessel is now fully set forth in the published rules of Lloyds Register, and these have been adopted after a full consideration of the best practice in this class of work.

It has been found to lead to good results when rivets with countersunk heads are used to make the angle of countersink in the plate less acute than that in the head (Fig. 40), so that the holding-on hammer swells the head out to fill the hole completely. It is found that this prevents the spreading of the rivet-head on the plate round the countersink, which sometimes happens when the rivets are supposed to have the same angle of countersink as the plate. Especially in light work is it necessary that the points of the rivets should be left full, and this not so much because of the holding power possessed by the full point, as is often supposed, but because full points imply a sufficiently long rivet, ample material on which to hammer, and in getting the rivet down there is a greater likelihood that the hole will be completely filled. The best practice in three-ply work is that by which the middle thickness is punched small and then rimered out. All punching should be done with a clean die, thus avoiding burrs, and the use of packing should be reduced to a minimum by thoroughly screwing up the work. The packing used is generally oiled paper, and the method taken to ensure water-tightness at the oil-bulkheads at the deck and at the side is shown in Fig. 41.

Pumping, Ventilating, Etc.

The general principles governing the design of the pumping arrangements are the same in all oil vessels, the details differing with the requirements of different owners. The oil-pumps are kept entirely separate from the pumps which fill or clear the water-ballast spaces of water, and no water-ballast pipe passes through an oil compartment, or *vice versa*. In a typical case two main lines of steel suction-pipe are fitted one on each side of the longitudinal bulkhead. Each line has a suction into each tank on its own side of the ship, and one passing through the longitudinal bulkhead to the corresponding compartment on the other side. Two valves are fitted to each suction, and these are actuated by wrought-iron rods carried up to and passing through the weather deck, and fitted with stuffing boxes and glands. There are thus two suctions in each compartment and four in each tank, an arrangement which permits both sides of the vessel to be dealt with through the same line simultaneously. In other cases each line has only one suction on each side of the middle-line bulkhead fitted with valves worked from the upper deck, a master valve being fitted to each line at each bulkhead, also controlled from the upper deck.

When oil cargo is carried in the summer tanks these spaces are sometimes fitted with drop-valves, which permit of the contents of each space being drained into the hold compartment immediately below, when it can be discharged through the main lines. This involves carrying the same quality of oil in the 'tween deck spaces as is carried in the corresponding hold space. More often the summer tanks are dealt with by means of an independent line about 4-in. bore.

In the typical case referred to above two pumps are placed in each pump-room, and the discharges are arranged so that there are two on each side at the after pump-room, two on each side at the forward pump-room, and one over the stern. The discharging arrangement adopted in various cases will obviously vary with circumstances.

Emptying Tanks

In emptying the tanks of oil, the pumps will clear the whole of the cargo in the tanks, but will leave the pipe-lines full. In the ordinary way this is drained into the end compartment and deal with by a hand-pump or by buckets. This trouble and waste are avoided if, at the end of the line furthest from the pump, a blow-out pipe is fitted extending to the deck. The pump is reversed and the contents of the line are forced up this pipe and into barrels on deck. Similarly, when water is carried as ballast before loading cargo, the main lines can be cleared of water quickly by this means.

The more extended use of oil fuel is a prominent feature in the oil vessels now being built, and in June last oil-fuel bunkers were being constructed in forty-five oil-carrying vessels building under survey with Lloyds Register, and complete oil-burning installations are intended to be fitted in thirty-five of these. The fuel oil hitherto used has had a flash-point of not lower than 150 deg. Fahr., and the bunkers in which it has been carried have been placed on each side of the boilers, or at the sides of the expansion-trunk, or in tanks forward of the oil space.

Recently, however, there has been a great development in the supply of oil fuel having a lower flash-point than 150 deg. Fahr., and when such low-flash oil is used the arrangement of bunkers, etc., must be materially modified. In that case the fuel-oil spaces are separated entirely from the engine and boiler spaces by a safety space or cofferdam. When ordinary high-flash oil-fuel is carried, the fuel-pumps for pumping the oil into the settling-tanks and boilers are usually placed in the stoke-hold. When low-flash oil is used as fuel, however, a special pump-room is constructed in the boiler space abaft the cofferdam. This pump-room is a water-tight compartment, is tested by

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being filled with water to the top, and has no direct communication with the machinery space. It contains only the pumps and a ventilating fan; the engines for driving these are placed outside, so that no steam-pipes are in the room. The ventilating fan is capable of renewing the whole of the air in the room in a very short time, and, in addition, supplementary ventilation is supplied in the form of a steam jet placed in the up-cast shaft.

Steam fire-extinguishing apparatus is fitted in all oil vessels, and provision must be made also for steaming out the tanks after the cargo has been discharged. In many cases the latter arrangement consists in the provision of hoses which take steam from the steam-line on deck and deliver it to each tank. In other cases a system of copper pipes, about 1½-in. bore, is led to each part of the vessel extending to within a foot of the bottom of the tank. In that case the fire-extinguishing installation and steaming-out arrangement may be combined in one set of pipes, by having a circumferential aperture of suitable size cut in the pipes just below the deck.

Upcast and Downcast Ventilators

When general cargo is to be carried, the tanks are ventilated in the ordinary way, by upcast and downcast ventilators, and when oil is carried these ventilators are closed by blank flanges. Except in vessels carrying benzine, the tanks are kept as far as possible sealed, a vapour cock only being fitted in the side coamings of the hatchways. When benzine is carried, a system of vapor-pipes is fitted, of about 2½-in. bore to main tanks, of about 2-in. bore to summer tanks, with cocks at each tank, and led to a main pipe of about 3-in. bore, which extends up the fore and main masts. Natural ventilation is provided for in other parts of the vessel, in pump-rooms, cofferdams, bunkers, etc.

In any survey of a subject so complex and of such scope as the one I have endeavored to deal with, it is unavoidable that much must be omitted which otherwise might have been discussed with profit. It has been my aim, however, to set forth the general principles, as I conceive them, upon which construction should be based, and I have pleasure in submitting these as being a very worthy subject for discussion.

PERSONAL

The New London Ship & Engine Co., Groton, Conn., has an interesting personnel and is adding to its efficiency constantly. L. Y. Spear, the president, graduated at the top of his class from the United States Naval Academy at Annapolis in 1890. He was selected by the government for the construction corps of the navy and was sent for a two-year post graduate course in naval architecture and engineering at the University of Glasgow, Scotland. He was then commissioned as assistant naval constructor in the navy, in which capacity he inspected and supervised the building of the modern navy. In 1902 he resigned from the navy department to become vice president of the Electric Boat Co. When the New London Ship & Engine Co. was formed, Mr. Spear was elected its president.

Frank T. Cable, vice president and general manager, took up electrical engineering upon leaving school and while engaged in this line became interested in submarine torpedo boats, having spent considerable time in installing the electrical equipment on the Holland, the first successful submarine ever built. He later joined the Holland company and took a foremost part in the design and construction of submarines. In 1908 he went to Germany to study the Diesel motor and procure the American rights to build such a machine. He built the first marine Diesel engine ever built in this country, now running successfully in the yacht Idealia. Mr. Cable was active in the formation of the New London Ship & Engine Co.

G. C. Davison, vice president, graduated from the United States naval academy in 1892. He resigned from the navy in 1908 to go with the Electric Boat Co. as vice president. He was elected vice president of the New London Ship & Engine Co. upon its organization.

Henry R. Bond Jr., secretary and treasurer, had no preliminary experience in ship yard work until he entered the employ of the New London Ship & Engine Co. in 1911, when he went directly into the shop and spent six months upon the test stands.

Frank W. Hibbs, supervising constructor, graduated from the United States Naval Academy in 1887 and entered the University of Glasgow in 1889, after two years' sea service. He resigned from the navy in 1903 to manage the Moran Bros. yard in Seattle. From 1909 to 1912 he was the Pacific coast manager for the Electric Boat Co., and in 1912 joined the New London forces.

Charles H. Bedell, electrical engineer, graduated from Haverford college in 1887 and from Johns Hopkins in 1888. He was with the Electro-Dynamic Co., as head of the electrical laboratory, until 1908, when he joined the Electric Boat Co., as electrical engineer.

William G. P. Lumsden's experiences were gained abroad. He left the British naval service in 1908 and was with Whitehead at Fiume until 1909, when he came to the United States to look after the first Diesel type engines to be placed in American submarines.

Donald R. Battles, naval architect, graduated from the Naval Academy in 1903 and served in various yards, until he resigned in 1912 to join the Electric Boat Co.

Hugo E. Grieshaber, assistant naval architect, graduated from Fordam Heights college, New York, and joined the Electric Boat Co. in 1905. He is in charge of the hull estimating and tracing departments under Mr. Spear.

Grant E. Edgar, assistant electrical engineer, graduated from Siglar institute and has been with the Electric Boat Co. since 1902. He is in charge of the electrical department under Mr. Bedell.

L. B. Doane was assistant mechanical engineer with the Fore River Ship Building Co. from 1906 to 1911, and is

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in charge of the engine drafting room under Mr. Davison.

Oscar A. Thelin is a graduate of the Orelro college, Sweden, and was at the Washington navy yard and naval torpedo station, Newport, R. I., until 1909, and is in charge of the hull mechanical department under Mr. Grieshaber.

W. W. Meek, who is in charge of the hull drafting room under Mr. Grieshaber, was with the Bath Iron Works until 1907, and then joined the Electric Boat Co.

A. McCulloch, who has made a study of order and shop system, joined the New London Ship & Engine Co. in 1912.

Hugo H. Momm was with the Electric Boat Co. from 1901 until the New London Ship & Engine Co. was started, when he was made superintendent of the shop.

James H. Ahearn, with the Blake & Knowles Pump Co. for 22 years, took charge of the machine shop of the New London company in 1912.

Peter V. Rehill joined the Electric Boat Co.'s forces in 1897, and when the New London company was started, was made erecting foreman.

Lawrence Hanlon has been appointed superintendent of ferries for the port of New York.

James C. Wallace, president of the American Ship Building Co. of Cleveland has returned from Egypt.

P. Paton has been appointed manager of the Northern Navigation Co., Collingwood, vice C. H. Nicholson, resigned. C. A. Macdonald is assistant manager and treasurer. James Playfair is president.

R. A. C. Smith, chairman of the New York state harbor commission, and president of the American Mail Steamship Co., has been appointed dock commissioner of the port of New York, vice Calvin Tompkins, resigned.

O. D. Duncan has withdrawn from the law firm of Goulder, Day, White, Garry & Duncan to become a member of an admiralty law firm in New York City.

Carmi Thompson, formerly United States treasurer, has been appointed general manager of the Great Northern and Hill ore properties, with offices at St. Paul, Minn.

J. Howland Gardner, formerly superintendent of marine construction for the Fall River Line, has been appointed vice president and general manager of the New England Steamship Co.

F. P. Palen has been appointed assistant general manager of the Newport News Ship Building & Dry Dock Co.; J. W. Gray, assistant to the general manager; J. B. Weaver, general superintendent; W. H. Benson, superintendent of hull construction; Neils Christiansen, superintendent of machinery; J. H. Lofland, assistant superintendent of hull construction.

The annual election of the Maritime Association of the Port of New York took place on April 22. The regular ticket headed by William Simmons for president was elected. The other officers are: Vice president, Edgar F. Luckenbach; treasurer, Frederick V. L. Jones. Directors: George D. Ali. Andrew M. Campbell, Thomas H. Franklin, Edgar E. Lethbridge, Rafael Rios and Marcus H. Tracy. Inspectors of election: William H. Anderson, George Christoffers, Edward A. Plunkett and William H. Raab. Auditing committee: William D. Dickey, William L. Gerrish and George E. Winters.

Oil Tanker Socony

Constructed to meet the requirements of the Panama canal trade, the giant tanker Socony, the last of a fleet of four steamers built for the Standard Oil Co., of New York, was launched at the plant of the New York Ship Building Co., in Camden, recently. The vessel was christened by Miss Natalie Todd, of New York, a daughter of William Todd, president of the Erie Basin & Drydock Co.

The tanker is 330 ft. long, 46 ft. beam and 27 ft. deep. She is equipped with two Scotch boilers and the machinery is adapted to the use of either coal or liquid fuel. The Socony is a bulk oil carrier of 30,000 barrels capacity, and is provided with all modern devices for the quick loading and discharging of liquid cargoes. The machinery is located aft, and the vessel will be lighted throughout with electricity. She is built of steel and will be ready for delivery in a few weeks.

OIL TANKER SOCONY LAUNCHED AT THE NEW YORK SHIP BUILDING CO.'S YARD, CAMDEN, N. J.

Two Great Ships Launched

Two great ships were placed in the water during April—the Vaterland, for the Hamburg-American Line, and the Aquitania, for the Cunard Line. The Vaterland is the largest vessel yet launched, exceeding the Imperator, which is about to go into commission, by 5,000 tons. The Aquitania is the largest vessel yet launched in Great Britain though she is slightly smaller than the Vaterland.

The Aquitania is 902 ft. over all, 97 ft. beam, 64 ft. deep. Her gross tonnage is 47,000 and displacement 49,400 tons. She will be equipped with steam turbines driving four screws and is designed for a speed of 23 knots. The Mauretania and Lusitania will still be the express liners of the Cunard fleet, though considerably smaller ships, being 785 ft. over all, 87 ft. 6 in. beam, 60 ft. 4 in. deep, having a displacement of 38,000 tons and a gross tonnage of 31,550 tons.

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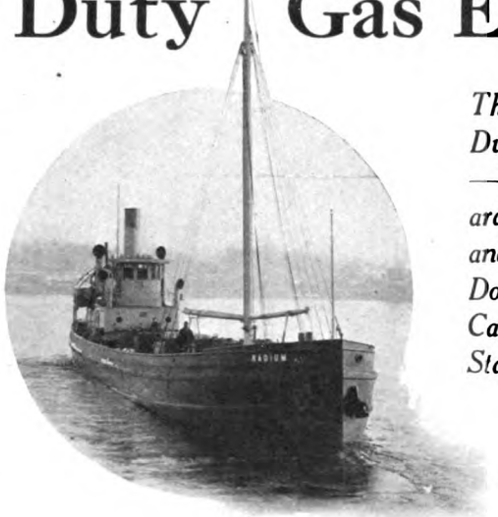
Heavy Duty Gas Engines

Some of the Products of the Gray Motor Co., The Clifton Motor Works and the Remington Oil Engine Co. Doing Service That Could Not Possibly Be Done by Steam Without Great Waste —The Field of the Internal Combustion Engine is a Growing One and Has, in Fact, Undergone Exceptional Development in the Past Few Years.



They Are Now Doing Satisfactory Duty in all Parts of the United States —The Radium Equipped With Standard Motor—The Natilie and the Hard and Constant Work Which She is Doing in Breakwater Construction at Cape May—The Reliability of the Standard Motor — The Illustrations Herewith Show Some Ugly Looking Craft, but for efficiency in Their Special Service They Cannot be Surpassed.

AN unusually large gasoline-driven boat, which is named the Radium, was recently built by the Skinner Ship Building & Dry Dock Co., Baltimore, Md., and is now in the service of the Gulf Refining Co. Her dimensions are 153 ft. length over all, 23 ft. 10 in. beam and 12 ft. 6 in. depth.

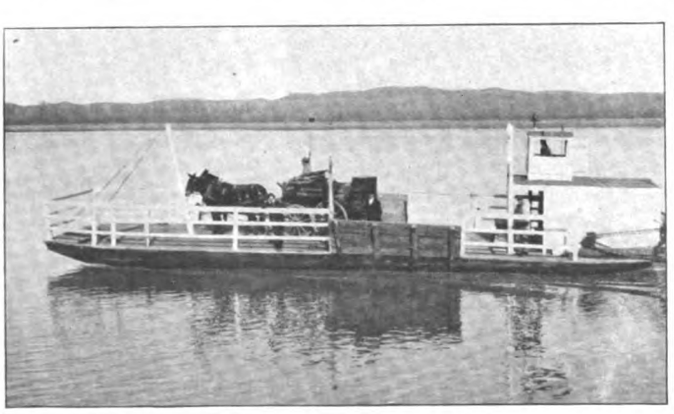
The vessel is built of steel throughout with the exception of the upper deck house, which is of wood and includes the pilot house, captain's room and cook's room. The lower house is of steel and includes the upper engine room, the entrance to the pump room, storeroom, engineer's room, deck hands' quarters and galley. All of these quarters are located in the after part of the vessel and are well lighted and ventilated.

In the hull of the vessel there are five main transverse bulkheads and one vertical fore-and-aft bulkhead, all made oiltight and providing eight compartments for cargo oil. The cargo oil is pumped from these compartments by four Gould "Pyramid" pumps, 6 in. by 12 in., located in the upper engine room and connected by belt to a 20-H. P. horizontal gasoline (petrol) engine. These pumps can be arranged to be thrown in or out of gear by Orton clutches worked by levers. The suction and discharge of these pumps is 4 in. in diameter, and all valves in the cargo lines are 4 in. iron body brass-trimmed flanged gate valves.

The Radium has a displacement of 750 tons and on her trial trip, loaded, showed a speed of 8.4 knots. She has a fuel capacity sufficient for a radius of 1,800 nautical miles. The propelling machinery consists of a standard air-starting and reversing single-acting gasoline (petrol) engine rated by the manufacturers, the Standard Motor Construction Co., Jersey City, N. J., as a 300 H. P. size, but which has been found capable of developing considerably greater horsepower. Two fuel tanks are located under the cargo pump space, having a capacity of 6,966 gallons. There is also a cylindrical tank in the engine room of 1,124 gallons capacity and a small tank for the pumping engine of 53 gallons. The total capacity of fuel tanks is, therefore, 8,143 gallons. Two air tanks, 18 in. in diameter by 8 ft. long, with a total capacity of 27.4 cu. ft., are located under the main deck in the engine room for supplying air for starting and reversing the main engine and for auxiliary purposes. In the after end of the engine room there is a fresh water tank of 507 gallons for supplying the galley. The vessel is lighted by a 2-K. W., 7½-H. P. Standard gasoline auxiliary engine, attached to which is a bilge pump and air compressor.

Natilie

The work which the Natilie, owned by the Breakwater Co. of Philadelphia, is called upon to do is probably the hardest that has ever been given to a power boat. This is in connection with the building of a jetty at Cape May, N. J. The Natilie runs from Cape May to near the breakwater and picks up 150-ft. barges laden with stone and tows them through the breakers and into shallow water, where they can be dumped. While doing this work the boat is often



NIOBRARA & SOUTH DAKOTA FERRY BOAT, EQUIPPED WITH GRAY MOTOR

LAUNCH GRAPHITE, EQUIPPED WITH 21-H. P. GRAY MOTOR

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driven ashore and pounded upon the hard sand bottom. This is what she was specifically designed for, and after several months she has not shown the slightest strain. The two heavily built steam tugs used hitherto could not stand the strain of this pounding upon the beaches.

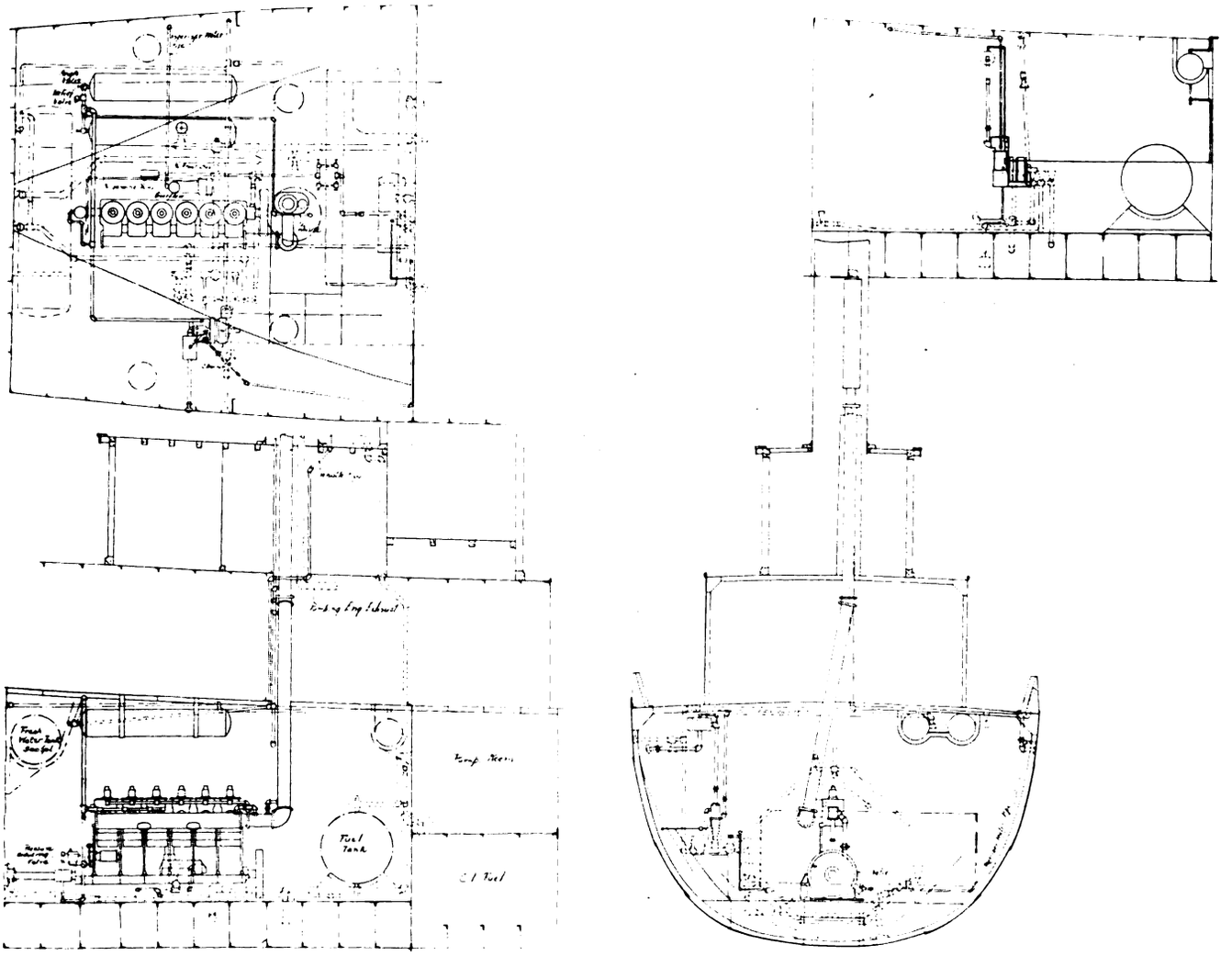
The Natilie is 65 ft. over all, with 18 ft. beam. Her least depth of hold is 6 ft. 4 in. and her normal draft is 3 ft. 6 in. She can be made to draw 12 in. more by means of water ballast. Her freeboard is 6 ft. 6 in. forward and 5 ft. aft.

Her framing is double sawed oak timbers 8½ in. by 8 in., spaced 22 in. on centers. Her deck beams are each 8 in. by 8 in., and 24 in. on centers. The main keel is a solid stick of oak 10 in. by 12 in. and the main keelson is 12 in. by 12 in. She has four sister keelsons, each 8 in. by 8 in., and bilge stringers each 6 in. by 10 in. Her sheer strake is 6 in. by 10 in.

It would seem that this framing would ordinarily be sufficiently heavy for a 125 ft. steam tug, but this is not all the extra weight in timber that enters into the Natilie's construction. She is planked with selected oak 2½ in. thick and sheathed with 3-in. yellow pine, bolted through. Her deck is of oak and pine, laid in strips 3 in. square. The oak skeg is built up tapering from 8 in. at the bottom to 14 in. at the shaft line. All fastenings are of galvanized iron, many of them being bolts set up with nuts, and every effort was made to fasten everything as securely as possible, weight of metal being disregarded to secure the maximum strength.

The superstructure is of oak and pine. The main house is but 3 ft. above the deck. The floor of the pilot house is 12 in. above the deck and the height of the roof is 8 ft. Although the superstructure was kept as low as possible, head room was not sacrificed. In the pilot house there is 6 ft. 6 in., and in the main cabin 7 ft. 6 in. The cabin is well arranged for the comfort of the crew, there being three staterooms, a combination galley and mess room, a toilet room and two large staterooms for hawsers, etc. There are also transoms in the pilot house that may be used as berths. There are two watertight compartments forward and two aft, one in each end being arranged that they may be used for the storage of fresh water for ballast or to supply the steam derrick barges and other vessels of the company. The tanks have a combined capacity of 15,000 gallons.

Probably no motor boat has such a complete and powerful engine equipment as the Natilie, as she has all the appurtenances of a modern wrecking tug combined with the equipment of a fire boat. Her main engine is a 125-H. P. air-starting and reversing Easter Standard engine. The engine starts, stops and reverses without the means of a reverse gear. Its operation is as simple as that of a steam engine, being done by the shifting of a lever. The compressed air is fed into the cylinders in the same manner as the gas cycle of the engine, so that one does not interfere with the other. A



INSTALLATION AND PIPING PLAN OF 300 H. P. STANDARD ENGINE AND 2 K. W. AUXILIARY ENGINE

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LAUNCHES PANSY AND GLADYS EQUIPPED WITH 21-H. P. CLIFTON ENGINE

LAUNCH "M. J. R." EQUIPPED WITH 28-H. P. CLIFTON ENGINE

compressed air pump built on the engine supplies a large tank. This pump has an automatic "cut-off" device, so that when the air pressure reaches its maximum it stops pumping. When the pressure drops below normal it automatically "cuts in" and starts pumping.

The Natilie is also equipped with an 8-H. P., 4½-K. W., Standard auxiliary engine direct connected to a 110-V. generator for operating deck and running lights and a 9-in. searchlight and two electric motors. The electric outfit has a telltale system, so that if one of the running lights goes out a light flashes in the pilot house and a buzzer starts.

One of these motors operates a 4-in. wrecking pump that is equipped with 25 ft. of hose, so that the tug may be placed alongside another vessel and pump her out. This pump can also operate four lines of 2-in. fire hose, taking the supply from overboard or from the fresh water tanks. Likewise, the pump can be used for transferring the fresh water from the tanks to another vessel or for shifting the tank water from one tank to the other. The auxiliary engine also has an air pump which can be used as a water pump, thus giving the boat two complete pumping outfits.

The second motor is on the after deck and operates a gypsy windlass, which is another novel feature for a tug of this size. This was installed for handling the 8-in. hawsers necessary for the work the Natilie does. There is an unusually large iron double bitt and windlass on the forward deck and large iron bitts on each side.

For ground tackle the boat is equipped with two patent anchors, one weighing 300 lb. with 200 fathoms of 4½-in. hawser, and the other 500 lb. with 200 fathoms of ¾-in. stud-link chain. The general outfit is practically the same as that on an ocean-going steam tug.

The Natilie was designed by Capt. I. A. Watrous, master mechanic of the Breakwater Co. She was built by M. M. Davis & Son, of Solomon's, Maryland. The Breakwater Co. has just bought a 300-H. P. Standard engine of the same type as the engine in the Natilie, which is to be placed in service in the Hawaiian Islands.

The Gray Motor

The Gray Motor Co., Detroit, Mich., have had unusual success in installing their engines in ferryboats and other small craft for commercial use. The photographs accompanying this article show the types of boats. The ferryboat City of Niobrara, owned by the Niobrara & South Dakota Ferry Co., is 60 ft. long and 20 ft. beam, with a stern paddlewheel 8 ft. high and 12 ft. long, with ten 12-inch buckets. The boat is equipped with a 36 H. P. three-cylinder Gray Model T and Paragon clutch. It makes a speed of six miles per hour running against the current and twelve miles per hour running with the current, and is used for ferrying automobiles and teams across the Missouri river. After the boat had been in use only about three months it had traveled about 900 miles. The motor up to that time was giving absolute satisfaction and the owners reported that when the engine was warm it would always start on the spark.

James S. Avery, Popular, Mont., operates a ferryboat carrying passengers and freight between Popular, Danville and Fort Teck Indian Reservation in Montana. This boat is equipped with a 24 H. P. two-cylinder Gray motor, and has given constant satisfaction.

The power boat Graphite, shown in one of the illustrations, is owned by Morton Rynearson, St. Andrews, Fla. This boat is equipped with a 21 H. P. three-cylinder Model T motor, and while the company does not recommend this type for heavy duty service, Mr. Rynearson is very enthusiastic about it. The boat is used in boarding vessels by the customs officers and is the speediest in the harbor.

A year ago last fall two of the 24 H. P. Model T's and one of the 36 H. P. Model T's were used by a contracting company in northern Canada for getting supplies to a large gang of men who were working on a railroad

SATILLA, EQUIPPED WITH 60-H. P. CLIFTON ENGINE

LAUNCH OSCEOLA, EQUIPPED WITH 28-H. P. CLIFTON ENGINE

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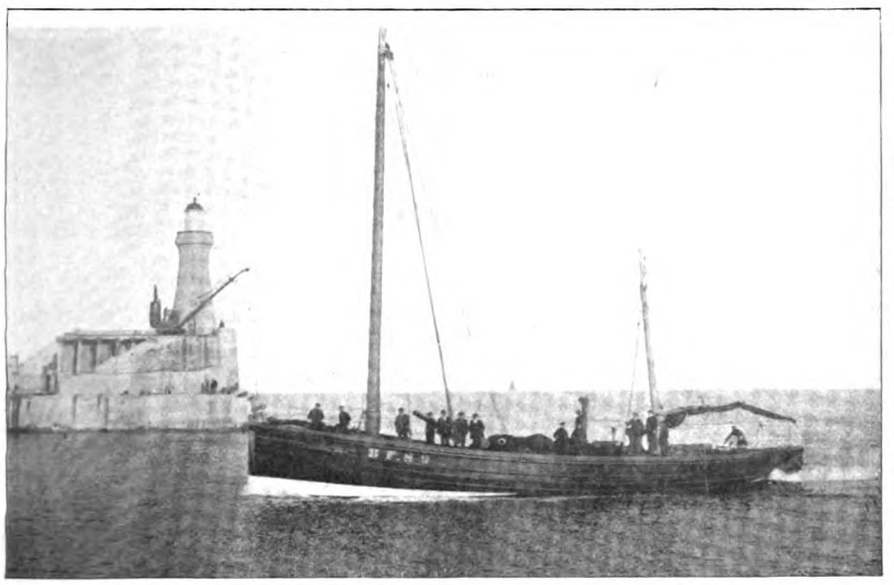
that was going through that section. The supplies had to be taken over a chain of three lakes. There was one motor in operation on each lake and each motor towed a big scow carrying provisions, tools, clothing. The work was carried on night and day and Sundays, and about 40 tons of cargo were transported daily, the work ceasing only when the lakes became frozen. In this instance a big contract for getting necessary supplies to the men was fulfilled in a manner that it would have been impossible to carry out without the aid of a reliable gasoline engine.



FISHING TRAWLER MOTHER'S JOY, EQUIPPED WITH 75 H. P. REMINGTON OIL ENGINE

Clifton Engine

The Clifton Motor Works, Cincinnati, O., have also installed their motors in a number of vessels that are used for commercial work in various parts of the United States. A few of them are illustrated herewith.

The White River Construction Co., of Branson, Mo., has used a sternwheel boat driven by a Clifton motor for towing barges of cement and other material from Branson up to the dam, a distance of about ten miles, for the past two years. The boats are very crude looking affairs, as the photograph testifies, but they have been very serviceable and practical.

The United States government engineer, with headquarters at Wheeling, W. Va., employs a 45-ft. steel row boat built by the Rippley Steel Boat Co., Grafton, Ill., and equipped with a 28 H. P. Clifton engine. It is used as a tow boat for towing barges and other vessels carrying material in the government service on the Ohio river. This boat has been in operation for about a year and has been very successful.

Captain Fred Wrege, Sheepshead Bay, L. I., has employed a power boat equipped with a 28 H. P. Clifton engine for towing and fishing during the past three years. He was so well pleased with the work of this boat that he has recently built two other boats and equipped each of them with 90 H. P. Clifton engines.

The launches Pansy and Gladys, which are used for towing in Galveston harbor, are equipped with 21 H. P. Clifton engines and have been in service for upwards of six years.

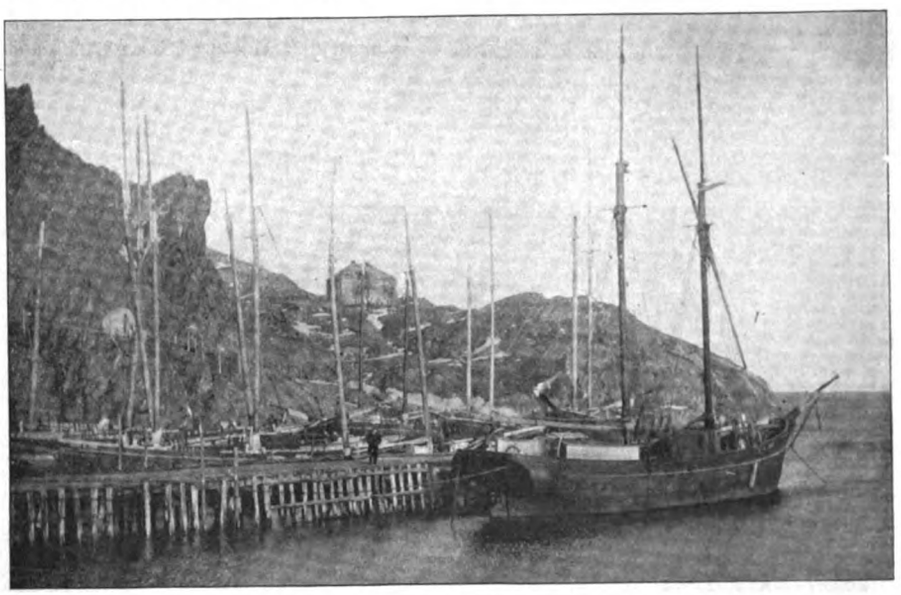
The launch Osceola, owned by George R. Reynolds, of Jacksonville, Fla., is equipped with a 28 H. P. Clifton engine and makes a speed of about eleven miles per hour. It is used as an excursion and delivery boat on the St. John's river, and has also been used by the United States government as a dispatch boat.

The launch Satilla, powered with a 60 H. P. Clifton engine, has been used as a tender for a dredge boat and for heavy work such as towing barges. It has been a very successful boat and has not caused any trouble or expense since the engine was installed over a year ago.

Remington Oil Engine

The Remington Oil Engine Co., 120 Broad St., New York, are the makers of strictly heavy duty machines, very simple in construction without delicate adjustments, and can readily be understood and operated by any one. All the parts are very accessible. The main bearings can be removed without disturbing the crank shaft. The connecting rod and piston can be removed by simply removing the heads, and the fuel and control systems taken off without disturbing any other parts. They operate on kerosene, fuel oil, distillates, crude oil, gas oils and many low grade oils sold on the market under a variety of names. The fuel consumption is about one-tenth of a gallon per horsepower per hour—never more than one pint.

A particularly successful installation is that in a sternwheel river boat owned by M. E. Benson and operating on the Black River, Ark. The engine, a 30 B. H. P., is located directly under the pilothouse. The boat has a steel hull, 68 ft. 6 in. long by 16 ft. beam on water line and 19 ft. on deck. There is a longitudinal shaft, 1 15/16 in. diameter, running from engine to a 2 3/16-in. counter shaft. The end of the 1 15/16-in. shaft carries a steel bevel pinion meshed with two cast iron bevel gears on the counter shaft. Each gear



TOPSAIL SCHOONER LADDIE, EQUIPPED WITH 75 H. P. REMINGTON OIL ENGINE

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on the counter shaft is fitted with a friction clutch so that the boat may be stopped, started, driven ahead or astern, without stopping the engine or otherwise paying any attention to it. The paddlewheel spiders turn loose upon the shaft. The drive from countershaft to paddlewheels is sprocket wheel and chains at each end. The beams carrying paddlewheel are hinged on center with shaft so that paddles may be raised or lowered by means of rods and turnbuckles to compensate for variations in draught of boat. The paddlewheel is 8 ft. in diameter by 11 in. face, carrying ten 13-in. paddles and turning 38 R. P. M. Concerning this boat Mr. Benson sent the Remington Co. the following letter: "Can't say enough for engine. The last trip brought 100 tons 65 miles and the whole trip of 130 miles cost $3.60 for fuel at nine cents a gallon."

A photograph is published herewith of the 81-ton top sail schooner Laddie, owned by Harold Bartlett, Brigus, Newfoundland, and equipped with a 75 H. P. Remington engine. The Laddie has been in commission in Northern Labrador and Hudson Bay for the last two years, where, owing to being in contact with heavy ice floes, the engine has had severe tests by being stopped by the propeller striking against ice when going at full speed without damaging the engine. Captain Bartlett says that after making trips of over 5,000 miles with the engine in almost constant use, the Laddie has never failed to make the harbor of Brigus without the use of sails.

A photograph is also published of the Scotch fishing boat Mother's Joy, owned by A. J. J. Wiseman and operating in the herring trade off the coast of Scotland. She is equipped with a 75 H. P. Remington oil engine and logs 8 knots per hour on straight runs of nineteen hours.

GOVERNMENT ENGINEER'S LAUNCH AT WHEELING, W. VA., EQUIPPED WITH 28-H. P. CLIFTON ENGINE

Regarding the performance of this engine, Mr. Wiseman wrote the company: "I may tell you that we have run our engine 45 hours without stopping, and there are none of the four-stroke engines that have done that yet from Lowestaft to Gardenstown. Your engines are the best and strongest."

S. P. McIntosh, Marianna, Ark., operates a sternwheel paddlewheel boat in commercial work. This boat is equipped with a 17½ H. P. Remington oil engine and has been in service for nearly three years. Mr. McIntosh says that it is still running as smooth as the day he started it, having run over 45,000 miles in the freight and passenger business and never having stopped five minutes on account of engine trouble. It consumes about one gallon of oil per hour.

STERNWHEEL TOWBOAT EQUIPPED WITH 60 H. P. CLIFTON ENGINE

PADDLE WHEEL FERRY AT POPULAR, MONTANA

Fishing Steamers With Blanchard Oil Engines

The auxiliary fishing schooner, Knickerbocker, built at the yard of Arthur D. Story, Essex and Glouscester, Mass., for use on the Pacific coast, left Boston recently for a run of 16,000 miles to Puget Sound. The sister vessel, Bay State, will leave in about a month. Both boats have been built for the New England Fish Co., to be used in the halibut fisheries operating out of Vancouver, B. C.

The sail plan of these boats shows an abbreviated area as compared with the old familiar type of fishing schooner. There is no top mast and the bowsprit has been omitted. This reduces both the height and length of the sail area and leaves simply four fore and aft sails—jib, staysail, foresail and mainsail. There is in addition a square sail on the foremast to be used when running before the wind. To offset this decrease in sail area each vessel is equipped with twin screws operated by 100-h. p. Blanchard marine oil engines, built by the Blanchard Machine Co., Cambridge, Mass. These engines are designed for using fuel oil which can be obtained on the Pacific coast at about $1 per barrel, and it is estimated that the difference in cost when operating full power with the engines would be about $50 per day in favor of fuel oil as compared with gasoline.

Among the advantages of this shortened sail area are the fact that the boats are safe and easy to handle in rough weather and that there is no outboard work for the men to do in handling sails. The only thing they have to fear are fog, collision and stranding on the shore. In addition, the smaller sails can be handled by a smaller crew although this would be a matter of no moment because as the vessel carries 18 dories there will

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be a crew of about 25 men when in active fishing service.

The official tests of the Knickerbocker took place March 18 when upwards of 80 men boarded her for a trial trip out in the Massachusetts Bay, which lasted from 11:00 A. M. until 4:00 P. M. The start was made from T Wharf, Boston, under the power of both engines. This was continued about 2 hours at a speed estimated to be in the neighborhood of 10 knots. The engines were then shut down and the balance of the trip out and the entire trip back were made under sail until the engines were required for maneuvering into the wharf. This gave the visitors an excellent opportunity to observe the weatherly qualities of the vessel, and as a stiff breeze was blowing, enough to bring the lee scuppers under the water a good part of the time, the test was a good one. Many of the visitors took a hand in handling the boat, and all were highly pleased at the ease with which she responded to the helm.

Designed by Thomas F. McManus, naval architect, who has the experience of some 300 vessels back of him, the Knickerbocker and Bay State represent the highest development of the art today in building of fishing schooners. They have comfortable accommodations for a crew of 24 forward, while the four offiecers are quartered in the cabin aft. The engine room is just forward of the officer's quarters, while the fish hatch is located between the engine room and the forecastle and galley.

The most interesting feature of the new vessel is the power plant. Each of the two four-cylinder engines weighs about 8,000 lbs. The cylinders have a diameter of 10 in. with a stroke of 10 in. and under full power the engines run at 320 r. p. m. Each engine is 11 ft. 4 in. long and 30½ in. wide, a very small space for the power. The height of the engine above shaft is 44 in. only, while the depth from the center of shaft to bottom of crank case is 11¼ in., thus making the total height of engine well under 5 ft. The propeller shafting is 3 in. in diameter, each shaft carrying one 3-bladed feathering wheel, 44 in. in diameter, with a pitch of 46 in.

The fuel oil carried on the long trip around the Horn is 7,000 gallons. This would be sufficient for about 12 days' continuous steaming at full power. It is proposed, however, to run the engines only when needed, as explained above, and also to run them about half an hour every day or two in order to be sure they are continually ready for use and not bound by rust or anything of that sort. It is expected that the 7,000 gallons carried will be sufficient to last for the entire voyage on this basis.

The vessels are of 155 tons each. The length over-all is 125 ft. with a water-line length of 102 ft. The water-line beam is 24½ ft., while the mean draft is 10 ft.

During the trial of March 18, the engines were in charge of Engineers Kempton, Waterbury and Arringdale, all of the Blanchard Machine Co. staff. Among others on board at the time of the trial were L. H. Goodspeed of the New England Fish Co., Thomas F. McManus, designer of the boat, Arthur Rowe, the outfitter and sail maker, and F. H. Plumb, of the Blanchard Machine Co.

Remarkable Stoker Boiler Test

In a recent test run by the Narragansett Electric Light Co., Providence, assisted by experts from the testing staff of the Boston Elevated, a Babcock & Wilcox boiler fitted with a Riley self-dumping underfeed stoker with five retorts, was run for eight hours at 216.3 per cent of builder's rating and gave the extremely high efficiency for that overload of 77.8 per cent. The boiler was 12 tubes high, 18 tubes wide, and 16 feet long, was operated at a boiler pressure which practically did not vary from 175 lbs. per square inch throughout the test, and was rated at 390 h. p.

The total weight of coal fired was 19,705 lbs., or 2,463 lbs. per hour. The analysis of this coal showed 77.44 per cent fixed carbon, 15.42 per cent volatile matter, 5.46 per cent ash, and 1.68 per cent moisture. As fired, the coal contained 14,728 British thermal units per pound, or 14,980 units when dried.

The weight of water fed was 217,600 lbs., the average feed water temperature being 196.6 degrees F. The equivalent water evaporated per hour from and at 212 degrees F. was 29,104 lbs., which gave a boiler horsepower developed of 843.6 or an overload of 116.3 per cent. The actual evaporation per pound of coal as fired was 11.04 lbs. of water. The equivalent evaporation from and at 212 degrees F. was 11.81 lbs. of water per pound of coal, an extremely high figure. The factor of evaporation was 1.07.

This stoker was narrower than the boiler; so much so that two more retorts could have been installed, with correspondingly greater consumption of fuel and evaporation of water. The boiler is twelve years old and no special effort was made to prepare it for the test. It is one of a battery of two, the other boiler being cold at the time of test.

The fire appeared to be in the same condition all the time and the boiler was kept on the regular line at about the same rate after the test was over. One noteworthy advantage was that there was no period of dumping, as the stoker automatically dumped itself continuously and thus avoided fluctuations incident to periodic dumping. The coal was thoroughly burned and there was a slight excess of air, as is indicated by the fact that the flue gas analysis showed 15.2 per cent CO_2; 0.02 per cent CO, and 3.7 per cent oxygen.

Hydraulic Suction Dredge

A large hydraulic suction dredge capable of excavating to a depth of 47 feet is under construction at the Polson Iron Works, Toronto, Ont., for the Canadian government, for use in the development of a harbor on Hudson Bay. It is to be delivered this summer and 600 men are steadily at work, as the contract calls for its completion in five months. The dredge will have a discharge pipe 24 inches in diameter, with a capacity of 20 cubic yards of material per minute, or 28,800 cubic yards per day. The dredge will be equipped with triple expansion engine 14 x 22 x 36 in., with a 21-in. stroke, and two Clyde boilers, 13 x 12 ft. The hull will be divided into six watertight compartments. To reach its destination the dredge will have to be towed down the St. Lawrence, around the Labrador coast and through the Hudson Straits.

The wooden steamer Uganda, bound from Chicago to Buffalo with 100,000 bushels of corn, foundered four miles east of White Shoals, Straits of Mackinaw, April 19, having been cut through by the ice. She filled so rapidly that nothing could be done to save her, but fortunately the bulk freighter John Donaldson was close by and took off the crew. The Uganda was owned by Edward Mehl, Erie, Pa., and was built by F. W. Wheeler in Bay City in 1902. She was 291 ft. long, 41 ft. beam and 19 ft. deep.

The repair ship, Robert J. Close, building for G. A. Tomlinson, of Duluth, was launched from the yard of the Superior Ship Building Co. on April 26. This vessel is intended to be used in repair work about the harbor of Duluth and is in fact a floating repair shop. The vessel is 125 ft. long, 30 ft. beam, and most of the machinery will be electrically operated.

J. Leopold & Co., ship brokers, have moved from 18 Broadway to 233 Broadway, New York.

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May, 1913

Would be a Farce

Richard Olney, former secretary of state, and one of the highest authorities on international law, in a paper, which was read last month before the American Society of International Law, at Washington, declared that the submission to the Hague tribunal of the question between Great Britain and the United States concerning Panama canal tolls would be a farce. Mr. Olney maintains that the United States as the sole owner of the canal has the right to determine under what conditions the canal shall be used. Mr. Olney cited that the Clayton-Bulwer treaty was brought about by the practical protectorate the government of Great Britain had over the eastern terminus of the old Nicaraguan canal and the belief that financiers would more readily subscribe to its promotion if Great Britain were in this way to stand sponsor for it. It was not then the idea that the United States should build it, but that the South American state, through which it passed, should do so.

He pointed out that later through the Hay-Pauncefote treaty the United States acquired rights to procure the land for the canal and to build the canal through its own land. He declared that the term "all nations" does not mean the United States, but all other nations, because the United States by acquiring title to the canal zone and proceeding to put the canal through it became proprietor of the property and as an owner it would not be supposed to charge its own shipping the same tolls as others. At any event it does not have to do so.

"This is an artificial waterway," said Mr. Olney, "and it is a clear principle of international law that the owner of artificial waterways may annex such conditions to its use as it may please."

Lewis Nixon, of New York, agreed with Mr. Olney, though other speakers expressed divergent views.

Lake Season of 1913

The lake season of 1913 opens better than any season of recent years. There is more business offering in all of the trades than has marked the opening of any season. Practically every vessel is in employment and so firm is the demand for them that shippers are making no discrimination in class. They are quite glad to get whatever they can get in the way of tonnage. With plenty of business offering vessel owners are inclined to choose their loads. The recent formation of the Interlake Steamship Co. has also improved the situation very much. This merger is one of the best things that has been done for lake trade in many years, giving great stability to vessel securities and improving the financial tone generally. It practically disposes of the surplus of ship that was an embarrassment to everyone two or three years ago. There will be no repetition of that era. The day of the promoter is past on the lakes and ships hereafter will be built only, as there is real need for them.

There is no sound reason why the bulk freight trade of the great lakes may not have the same stability as railroad trade. It is an ever-growing business and is assured to the ship since it can be handled in no other way. The leading interests are taking every precaution to make it a safe business. Considering the number of ships moving and the volume of freight carried, accidents are annually getting less in number and in cost. Masters are told that the safety of their ship is their first consideration and that they must take no chances. The result of care in this direction is reflected in the insurance premium which has undergone a substantial reduction in the past two years, and the Great Lakes Protective Association is finding it to its advantage to carry 25 per cent of the total insurance.

Admitting Ships' Materials Free

The Panama Canal act contained a rider permitting the importation of articles of foreign production free into this country for the construction or repair of vessels, the paragraph reading:

"That all materials of foreign production, which may be necessary for the construction or repair of vessels built in the United States, and all such materials necessary for the building or repair of their machinery, and articles necessary for their outfit and equipment, may be imported into the United States free of duty under such regulations as the secretary of the treasury may prescribe."

The Underwood tariff bill now before the house

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would repeal this provision in the Panama act by substituting for it the following:

"That all materials of foreign production, which may be necessary for the construction of vessels built in the United States for foreign account and ownership or for the purpose of being employed in the foreign or domestic trade, and all such materials necessary for the building of their machinery and all articles necessary for their outfit and equipment, may be imported in bond under such regulations as the secretary of the treasury may prescribe, and upon proof that such materials have been used for such purpose, no duty shall be paid thereon.

"That all articles of foreign production needed for the repair of American vessels may be withdrawn from bonded warehouses free of duty under such regulations as the secretary of the treasury may prescribe."

Those that are quite eager that the American market should be thrown open to the foreign manufacturer in the construction of vessels seem to believe that the provision in the Underwood bill is less liberal than that contained in the Panama Canal act, which it supersedes. Apparently little advantage has been taken of the rider in the Panama Canal act, nearly all of the leading shipbuilders of the coast reporting that they have imported little or nothing. The provision, however, is a menace if a substantial revival occurs in shipbuilding in the United States.

Safety at Sea

The International Conference on Safety at Sea will be held in London during the coming fall and undoubtedly conclusions will be reached which, when put into effect, will render impossible in the future such an appalling catastrophe as overtook the Titanic. It will be borne in mind that following that lamentable tragedy thousands of suggestions were made for safeguarding life at sea, most of them ridiculous. The subject was well stated by the late Sir William Henry White, when he said:

"When calmer consideration of the subject becomes possible it will be seen that the question of boat equipment, important as it undoubtedly is, must be treated as subordinate to efficient watertight subdivision. Possibly the time is approaching when ship owners will concur in action by which such subdivision shall be made the subject of legislation on lines to be agreed upon by the Board of Trade and themselves. In view of the experience gained in connection with legislation for the load lines of merchant ships, it is permissible to hope that if such action is taken it may be of an international character and that arrangement would undoubtedly be most advantageous if it could be made."

The British and German governments for some months past, through committees composed of technical experts, have been examining the subject of the watertight subdivision of the hulls of ocean passenger steamers in order to be prepared to discuss at the international conference the important and difficult questions as to what extent, if any, and how, the hull construction of ocean passenger steamers may be governed by state or government regulations and whether an international agreement on the subject may be feasible.

The United States so far has delayed the appointment of a similar committee, though Secretary Redfield, of the Department of Commerce, is now giving the subject attention. He recently held a meeting in Washington, which was attended by Admiral Washington L. Capps and W. I. Babcock on behalf of the Society of Naval Architects and Marine Engineers, Admiral Watt, the chief constructor of the navy, Eugene Tyler Chamberlain, commissioner of navigation, and General George Uhler, of the Steamboat Inspection Service, representing the government. Shipbuilders were represented by President Smith, of the Harlan & Hollingsworth Corporation; President Hopkins, of the New York Shipbuilding & Dry Dock Co.; President Wood, of the Maryland Steel Co.; President Grove, of Cramp's, and President Hyde, of the Bath Iron Works.

The point was rather taken out of the conference by the secretary's announcement that there was no money available for the preliminary work and little prospect that any would be appropriated. If the United States is to have a hand in this international conference, it should certainly see that the delegates that are to be sent are liberally provided for. The work is highly technical and requires a trained mind and men of that sort cannot be expected to work for nothing. Secretary Redfield should endeavor to obtain an ample appropriation from congress for this conference, which is one of the most important that has ever been projected in the interest of navigation.

Information from Panama is to the effect that another slide has occurred at Cucaracha. Nine steam shovels, each working a 12-hour shift, are at work removing the new burden which has been deposited in the canal basin. If ships really pass through by October, as Col. Goethals hopes, a monumental work will have been achieved, as the slides in this particular section alone have practically amounted to 20 per cent of the total excavation.

The committee on inter-oceanic canals has voted 13 to 1 to postpone action until December on Senator Root's bill to repeal the provision of the Panama Canal act giving free passage to American ships through that waterway. As it is the expectation of Col. Goethals to open the canal to navigation in October, American ships will be passing through free before Congress convenes again. This will establish a precedent which ought to be permitted to remain. The United States undoubtedly has the right to pass its domestic shipping through the canal free.

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General Average, Principles and Practice in the United States of America; by Ernest W. Congdon; 220 pages, 6 by 9 in.; Baker, Voorhes & Co., New York, publishers.

Ernest W. Congdon, the author of this work, is a member of the Association of Average Adjusters of the United States. He states in the preface that it was his aim in compiling this handbook to give ship owners, merchants and others interested in shipping a brief outline of the established principles of general average in the United States and of the manner in which claims of that nature are in practice dealt with. To those advanced in knowledge of the subject it may serve as a handy reference. Those who wish to make a thorough study of this important branch of the maritime law must be referred to text books and decisions of courts. The most frequently occurring instances of general average are touched upon in the different chapters. The author desires the reader to divest his mind of any erroneous impression which he may have gathered that general average has any necessary connection with or is dependent upon insurance. The law of general average had its foundation in equity and its elementary principles were practiced long before insurance was introduced. It applies only to shipping and is a part of the established law of the sea as distinguished from the law of the land. General average, the doctrine of which is part of the maritime law of all nations, and to which government property as well as private property is subject is not dependent upon contract, although the rights to it can be varied by contract. It rests upon the equitable principle that whatever voluntary loss is sustained for the benefit of all parties to a common maritime adventure must be borne by all in proportion as those interested are benefited. It is, however, a sine qua non that the party claiming contribution in general average must come with clean hands to be able to enforce it, this rule being founded on the time-honored principle in law that the wrongdoer cannot derive any benefit at the expense of those who are innocent. The claimant to be successful must either be innocent or be made so in the eyes of the law by valid contract if negligence of his servants is involved.

Book of Standards; published by the National Tube Co., Pittsburgh, Pa.; 559 pages, 4 by 6½ in.; price $2.00.

The present edition is the first since 1902, and though it contains over 550 pages, is not quite five-eighths of an inch thick, as it is printed on Canterbury Bible stock. The information incorporated has made it strictly a pipe handbook and as such it is believed will find an immense use with the trade. The index will be found to be very complete, being thoroughly cross indexed and there are approximately 4,000 references in the index.

Several pages are devoted to a descriptive article covering the main process of manufacturing both welded and seamless tubes, also giving information in regard to the threading, durability and physical properties, etc., of both "National" pipe and Shelby seamless steel tubes.

There are a number of pages which give weights, dimensions, threads per inch, test pressure, sections of joints, specifications, etc., of the various kinds of pipe and tubing made.

Tubular electric line poles receive considerable attention; the information given will help an engineer in understanding more about tubular poles which are being used by many of the larger cities as a medium for better service, better appearance, etc. Various types of joints are described and illustrated. Full tabular information is given for poles from 22 to 40 feet, showing lengths of sections, size of butt, weight, thickness, greatest load pole will carry, etc.

Several pages describe, illustrate and contain tables in regard to lap weld and seamless tubes, upset and expanded, wrought pipe bends, butted and strapped joints, bump joints, valves and fittings, including various kinds of nipples and flanges, hand railings and ladders, working barrels, cylinders and Shelby seamless specialties.

Considerable prominence is given to articles on strength of tubes and cylinders under internal fluid pressure and collapsing pressures. Both of these papers are very complete and have been extracted from papers by Prof. R. T. Stewart, dean of mechanical engineering department, University of Pittsburgh, and read by him before the A. S. M. E. Several of the formulae are compared and results of actual tests are given. Tables are given which show the probable collapsing and bursting strengths of standard tubes. These articles and tables will prove of immense benefit to the mechanical engineer, especially in the connection with boiler engineering problems.

An article covering pipe used as columns is given, tables are supplied showing the use of standard, extra strong and double extra strong pipe based on the New York building code as well as the Chicago building ordinances.

Considerable attention is given to the mechanical properties of solid and tubular beams, of usual and ususual shapes. As tubing is finding considerable usage in the mechanical field, notably in automobile construction, this data is particularly useful. This article is accompanied by tables giving the mechanical properties of solid and tubular beams of uniform cross section, various conditions of loading are illustrated and formulas are shown to secure their physical properties values. Unusual shapes are illustrated and formulas given to secure their properties as beams or columns.

Chapters are supplied giving information in regard to water, gas, steam and air. It has not been the intention to go very deeply into these various subjects, only in so far as they concern tubular products.

A special table is shown by means of which it is possible to find directly the weights of nearly all sizes and thickness of steel tubing up to 36 in. in diameter. By means of factors weights of various other metallic tubing can be found.

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A table showing properties of tubes and round bars is given with an explanatory article. This table gives various physical properties, including circumference, area, weight, surface in square feet, volume, moment of inertia, radius of gyration, etc., for tubes and round bars up to and including 36 in. This data is given in increments of 0.01 in. up to 16 in. and increases from there by ⅛ in. increments to 36 in.

The metric system is included with conversion methods for most of the more commonly used measures, including temperatures.

A glossary of terms used in the pipe and fittings trade will be found in the back of the book and in many instances the meanings of many of the more or less well-known words used in this trade are defined.

Shipping World Year Book; published by the Shipping World, Effingham House, Arundel street, Strand, London.

This is the twenty-seventh edition of a work that has become encyclopedic in character. Some of the new features include the tables of freeboard revised to date by the board of trade, the present position of European nations in respect to an international load line and also of life-saving regulations; a digest of the merchant shipping acts from 1894 to 1913 with all orders in council and board of trade regulations pertaining thereto. The new map for 1913 shows in distinguishing colors the routes of steamers and railways throughout the world with the east-bound and west-bound lines across the Atlantic and the ports, coaling stations, coal fields of all countries. The directory of all the commercial ports of the world gives the particulars of the accommodation, charges, tides, trades, pilotage and towage and is revised to date. The tariffs of all nations have demanded minute care in revision during the past 12 months and many important changes will be found in them.

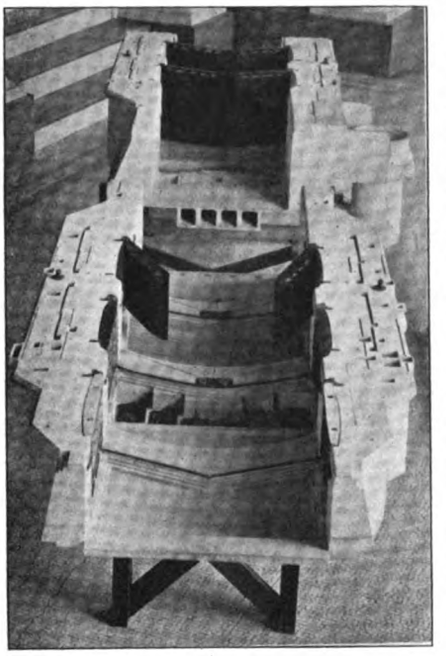
New Log and Versine Altitude Tables, by Lieut. Radler de Aquino; 122 pages, 6 by 9½ in.; price 60 cents; J. D. Potter, 145 Minories, E. C., London, publisher.

This book tabulates the elements of the astronomical triangle of position, rendering its solutions by means of complicated formula and logarithms unnecessary.

"Look out," cried the chauffeur as he ran over the Irishman. "Faith," said Pat, sitting up, "are yez coming back."

Third Lock at the Sault

Excellent progress is being made upon the construction of the third lock at the Sault. The excavation of the lock pit was completed early in the year. The work is covered by separate contracts. The Great Lakes Dredge & Dock Co., of Chicago, has the contract for the lock masonry and for the east canal. Mac Arthur Bros. Co., of Chicago, have the contract for the west canal. Other contracts are as follows: Lock gates, Penn Bridge Co., Beaver Falls, Pa., pumping plant, Alberger Pump & Condenser Co., New York; machinery and valves, J. & J. B. Milholland Co., Pittsburgh; arc lighting system, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.; fir timber, John Schroeder Lumber Co., Milwaukee, Wis., and McCormick Lumber Co., McCormick, Wash. Some work still remains to be contracted for, the most important of which is that of constructing the new power house.

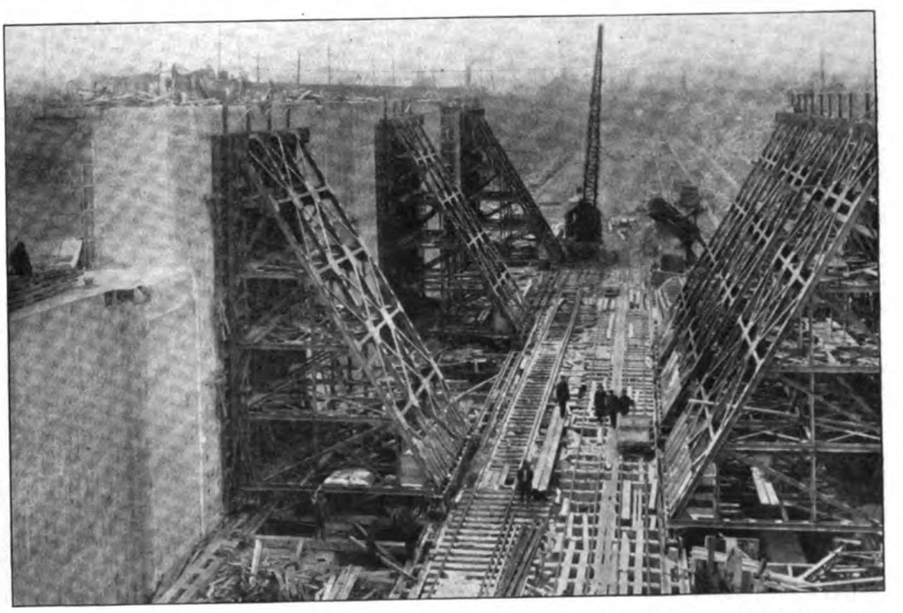


MODEL UPPER AND LOWER ENDS OF THIRD LOCK

The contracts for canal construction call for completion in May, 1914, and more than one-third of the work is now finished. The date fixed for the completion of the lock masonry is July, 30, 1913. Work is progressing satisfactorily on all contracts and it is believed that the entire work will be finished in 1914.

The lock will be 1,350 ft. long, 80 ft. wide and with the least depth of water over the miter sill 24 ft. 5 in. It will, therefore have an available draft of about 6 ft. more than the Poe lock. Its unusual length will permit the locking through of two of the largest vessels in tandem style at one time.

Six culverts are provided for to fill and empty the lock. The walls are built up from bed rock in sections, alternate sections being constructed first and the intermediate sections later. The walls are 50 ft. high and 26 ft. wide at the base.



NEW LOCK AND CANAL. GENERAL VIEW LOOKING WEST FROM MIXER PLANT

The Necessity of Boiler Circulation

The Eckliff boiler circulator, manufactured by the Eckliff Automatic Boiler Circulator Co., Detroit, Mich., consists of a series of tubes bent to conform with the furnaces. These tubes are constructed to run vertically from the bottom of the boiler

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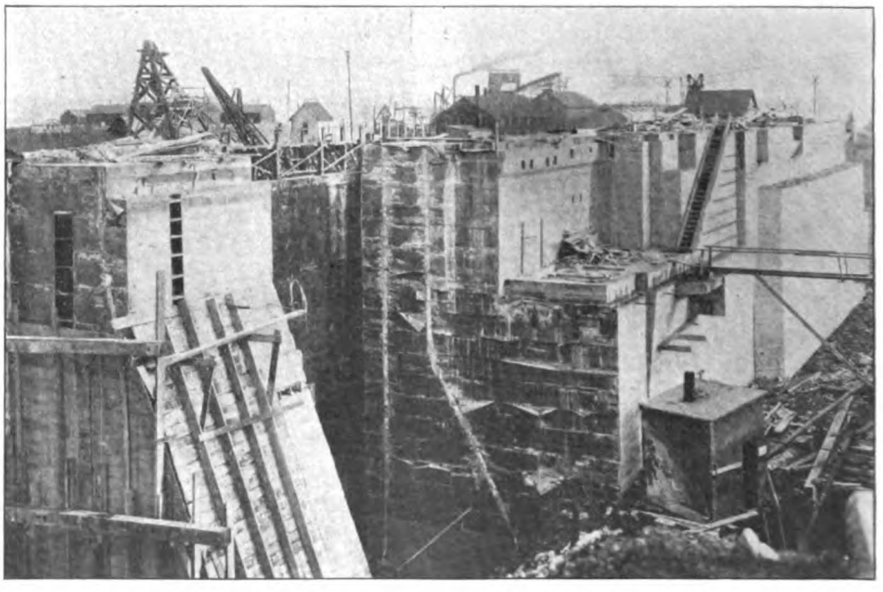
LOOKING SOUTHWEST FROM WEST LOCK COFFERDAM. FIRST WORK IN ROCK

to the top of the furnaces, and thence horizontally along the top of the furnaces, being in contact with the entire length of the furnace, excepting 1 ft. at each end where the tube is bent upward at an angle of 30 degrees. This forms the discharge nozzle.

The action which takes place is as follows: The water contained in this tube is held in contact with the hottest portion of the boiler, thus, due to the fact that it cannot liberate its energy during the entire journey through the tube, this water must naturally attain a much higher temperature than the water surrounding the tube. Therefore, its specific gravity becomes so much less than that of the water surrounding the tubes that it discharges from the nozzle and fresh water takes its place at the intake at the bottom of the boiler.

The velocity with which each of these tubes works is approximately 5,000 gal. per hour, thus it is evident that if from two to four of these tubes are placed in a boiler you get the maximum amount of circulation in a boiler so equipped. Therefore, when the circulators have siphoned all of the cold water from the bottom of the boiler, the hot water level now being at the bottom of the boiler, the heat contained in this great volume now rising to the surface of the boiler, sets up a most violent circulation, and boilers equipped with four circulator tubes are claimed to maintain a temperature which is from 5 to 8 degrees higher than the temperature shown in the steam dome of the boiler. It is said that with this system of circulation it is possible to create so violent a circulation that the ebulition becomes so great that it causes some of the water to rise so high that it reaches the dry pipe in the boiler. This is brought about by the circulators causing a powerful down current in the center of the boiler between the furnaces, thus the up current in this boiler takes place along the shell from the bottom and gathers momentum along its entire journey to the top, and follows the shell after



BACK OF SOUTHEAST WIDE WALL. FACE FROM BLOCK 113 IN PLACE

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the water line is reached. Where this trouble is met it is necessary to either remove part of the circulating capacity or to install two baffle plates the length of the dry pipe, and place them about 18 in. from each side of the dry pipe to stop the water which, due to its velocity, flows along the shell to the baffle plate, where it is stopped, and has to drop down, thus preventing the water from entering the dry pipe.

It is evident, therefore, that when this strong circulation is brought about in a boiler that the thermal efficiency of the boiler is increased because the circulation scours off the dead air filament which adheres to the hot surfaces of the boiler, and permits the water to absorb the heat liberated from the plates more readily, thus preventing the overheating of the plates and consequent crystallization, especially at the combustion chamber end of the furnaces, where either the rivets are a constant source of trouble or the top of the furnace cracks, due to the lack of circulation and equalization of temperatures throughout the boiler.

Furthermore, it is an established fact that when water is heated to a temperature of 300 degrees Fahr. or over that all organic matter contained in it will precipitate due to the specific gravity of the organic matter being so much greater than the water at that temperature. Therefore, it is evident that the feed water being fed to a boiler equipped with the Eckliff circulators must not be liberated anywhere but at the extreme bottom of the boiler, as this becomes the settling chamber for all the foreign matter carried into the boiler, because the circulator intakes are 4½ in. from the bottom of the boiler, and the feed water on entering the boiler being at a much lower temperature than the water contained in the boiler precipitates instantly to the bottom and remains there until it absorbs the surrounding temperature which it receives almost instantly. It then rises again to the level of the circulator intakes where it then enters to be swiftly conveyed to the upper parts of the boiler.

Therefore, all scale formation in the boiler is prevented if the space from the shell to the surface of the intakes of the circulator at the bottom of the boiler is kept free from the sludge which accumulates at this point so as to permit the feed water to precipitate the organic matter contained in it before it reaches the circulator intakes. A perforated blow-off system consisting of three pipes is supplied to remove this residue.

These pipes are provided with slots properly spaced and the total area of same being not quite equal to the area of the blow-off pipes, thus removing the sludge equally from the entire settling chamber of the boiler.

Summing up the above, the following benefits will be derived through use of the Eckliff automatic boiler circulator:

The equalization of temperatures throughout the boiler.

The dead air filament removed from the hot surfaces.

The thermal efficiency of the boiler increased.

A great fuel saving effected.

Scale formation minimized.

Pitting, grooving and furrowing, furnace cracking, breaking of stay bolts are entirely eliminated.

Leaky girth seams stopped at once, as the circulator commences its action as soon as fire is applied to the furnaces, and continues to act as long as heat is being liberated from the top of the furnaces.

Studying Rivers and Harbors

That the new terminals in the United States may be satisfactorily equipped according to the printed "Conclusion" of the last International Congress of Navigation, namely, "the mechanical tranferring of miscellaneous cargoes from the vessel's hold or from the vessel's deck or from the pier's side to all areas embraced within the terminal limits." H. McL. Harding, chairman of the commission, consulting engineer, department of docks, New York City, has sailed for Europe to make an extensive study at the river ports and railway terminals where the latest types of mechanical appliances are employed in the transferring of miscellaneous cargoes and package freight. Mr. Harding will also visit the works where freight handling appliances are manufactured.

Herbert K. Oakes, of Cleveland, has purchased the steamer D. M. Whitney

THE "SHIPPING EXPERT" AT WORK

Expert:—I say, Cap'n, that's a powerful fog horn.
Captain:—Eh? What?

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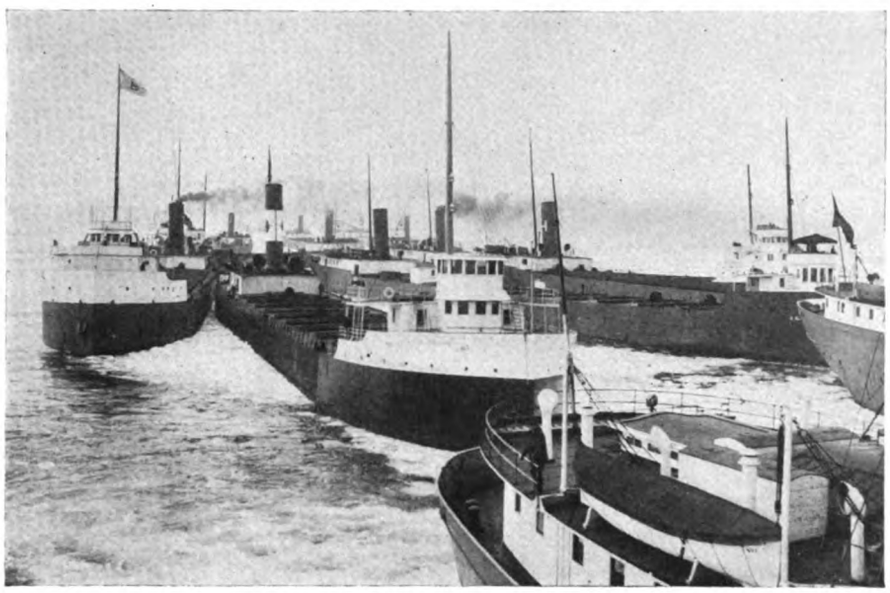
Opening of Lake Trade

Considering the clemency of the winter, the opening of navigation on the great lakes this spring was attended with unusual difficulty. It has been many years since vessels encountered as much ice as was met with in Lake Superior during the last week of April. Even as late as May 1 there was considerable ice in Whitefish Bay, and the more conservative owners were still delaying sending their barges through. The grain fleet which left Fort William upon the official opening of navigation, April 15, were practically delayed for ten days or more in the ice, and the ice crusher St. Ignace made repeated attempts to release them without success. Masters were under strict injunction not to buck the ice, but nevertheless some of them lost blades off their wheels and produced more or less repair work for the shipyards.



JAMMED IN THE ICE IN WHITEFISH BAY
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The movement of ore during April was good, though little of it reached Lake Erie ports during that month. Ore at upper lake ports was frozen in the stock piles and was not easy to handle. As congestion existed both at upper and lower lake ports, ore carriers waiting several days for cargoes and the grain fleet waiting several days at Buffalo to unload, it was practically the second week in May before anything like a regular schedule was observed in lake trade.

The Great Lakes Protective Association has fixed the insurance rate at 4 per cent for the season of navigation, that is from April 15 to November 30, and 4¼ per cent on policies to run to April 15, 1914. The Association this season will carry 25 per cent of the insurance of its subscribers.

There is this to be said, however, that lake trade was never in better shape than it is today. The taking over of the Gilchrist vessels, as well as other fleets not well entrenched by powerful interests has done much to improve the general financial situation and to strengthen the vessel-owning business generally. There is a firm demand ruling for vessels in every branch of the bulk freight trade, and vessel owners will during the present year recoup the losses which they have suffered during the past few years. Already a shortage of tonnage exists in the Lake Michigan coal trade and a premium of 5 cents has been offered for capacity. Ore shippers are also in the market thus early for wild tonnage, which augurs well for the future from the vessel owner's point of view.

NAVIGATING WITH DIFFICULTY
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Interlake Steamship Co.

The stockholders of the Lackawanna Steamship Co. met in the offices of Pickands, Mather & Co., Cleveland, on Friday, April 25, and ratified all the steps which had been taken by the company for the purchase of 17 steel steamers belonging to the Gilchrist Transportation Co., as well as the fleets of the Mesaba Steamship Co., the Provident Steamship Co., the Acme Steamship Co., the Standard Steamship Co., the Huron Barge Co., and the Interlake Co., giving it with the seven vessels it already possessed, a fleet of 37 steel steamers and two steel barges, making it, with the exception of the fleet operated by the Pittsburgh Steamship Co., on behalf of the United States Steel Corporation, the largest fleet on the lakes.

The Lackawanna Steamship Co. surrenders its title and the fleet will hereafter be known as the Interlake Steamship Co., as possessing a somewhat more comprehensive meaning. The basis upon which the several fleets were taken over was published in detail in The April MARINE REVIEW.

The Interlake Steamship Co. elected the following officers:

President, Harry G. Dalton.

Vice president, H. S. Pickands.

Secretary and treasurer, E. P. Williams.

Assistant secretary and assistant treasurer, C. C. Canfield.

Directors, Samuel Mather, H. G. Dalton, H. S. Pickands, James H.

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Hoyt, Moses Taylor, H. P. McIntosh and A. T. Kinney.

The fleet will be managed from the offices of Pickands, Mather & Co., Western Reserve building, Cleveland.

Kean, Taylor & Co., jointly with Kissel, Kinnicutt & Co., of New York, have purchased the entire issue of $3,000,000 Interlake Steamship Co. first mortgage 6 per cent gold bonds, dated May 1, 1913, and maturing serially $250,000 annually beginning November 1, 1914. These bonds are a first lien on the thirty-nine vessels of the Interlake fleet.

Thirteen of the steamers of the old Gilchrist fleet were renamed as follows:

Old Name.	New Name
J. B. Wood	Arcturus
L. Woodruff	Argus
George H. Russel	Canopus
F. W. Gilchrist	Cepheus
H. S. Sill	Cetus
J. L. Weeks	Corvus
J. C. Gilchrist	Cygnus
R. E. Schuck	Hydrus
F. J. Hecker	Perseus
R. L. Ireland	Sirius
P. G. Walker	Taurus
Lake Shore	Indus
Gilchrist	Lupus

Francke Flexible Coverings

Smith-Serrell Co., Inc., 90 West street, New York, have just issued bulletin No. 18 descriptive of the Francke flexible couplings which have been on the market now for over a year and have proved successful. It is made in sizes from that suitable for a ¼-in. shaft up. The coupling is simply an ordinary flange coupling connected by flexible instead of rigid bolts. The flexible pins are made of tempered steel leaves held at each end by a keeper which prevents their getting loose or lost and makes of each pin a flexible bolt. The keepers are slotted at each end to engage spring rings which also fit in a groove in the coupling flanges. They hold the leaves in a radial position for driving and also hold the keepers stationary in the coupling flanges. All the leaves except two short ones at each end are slotted. The short ones are held stationary, making all movement come on the tempered steel leaves. The slotted leaves do the driving and distribute the work over a large area of hardened steel. The slots allow the coupling to adapt itself to any misalignment. When shafts are out of line the coupling wants to run open on one side and shut on the other. No other type of coupling will do this without excessive wear. The Francke flexible coupling allows shafts to run out of line.

WAITING FOR A THAW

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WAITING FOR THE ICE CRUSHER ST. IGNACE

Copyrighted by Young, Lord & Rhodes.

Titanic Suits

Judge Holt's decision in the federal court dismissing the petition of the Oceanic Steam Navigation Co., owners of the White Star liner Titanic, for a limitation of liability under American law has created a curious situation. Under American law the liability of the company would be limited to passage money and salvage which in the case of the Titanic only amounted to $90,000, the salvage consisting simply of nineteen lifeboats. Under British law the liability based on tonnage will reach $3,000,000, but all suits must be entered within a year. Suits for damages aggregating $16,000,000 have been filed, but a large part of them were filed after a year had elapsed and are therefore under Judge Holt's decision invalidated, as he holds the Titanic cases must be tried under British law.

The Pringle Barge Line Co., 912 Rockefeller building, Cleveland, has bought the tug Chase S. Osborne from the Security Trust Co., of Detroit. The Osborne was built in 1906 for the Perry Lumber Co., Sault Ste. Marie, Mich., for raft towing on Lake Superior.

Captain Robert C. Pringle is now in charge of the Pringle Barge Line Co., which has recently removed from St. Clair, Mich., to 912 Rockefeller building, Cleveland, O.

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Isherwood System of Construction

In Which the Author Shows the Transverses of the Vessel

By Robert Curr

THE accompanying plan with this article shows the transverses of the vessel. The transverse takes the place of the frame or it might be the web punched out for the longitudinal frames to pass through, the frames being omitted.

The first iron frame was composed of four parts, viz: the frame reverse angle, floor plate and beam. Later when steel was introduced bulb angles were made, thus reducing the frame to three parts; the reverse angle being dispensed with.

The transverse may be the name adopted by Isherwood for it simply represents the cross section of the vessel and without the transverses there would be no Isherwood system.

The longitudinal framing has always been favored but the difficulty has been in sacrificing of the cross section.

The Isherwood system of transverses has overcome this, which will be seen by the plan herewith.

The transverse shown is thirty (30) inches at its narrowest part. In the first article (in the September MARINE REVIEW), the midship section shows the transverse and by comparing the plan of the transverse with the midship section it will be seen that there is a slight difference, viz: the scoring out for the longitudinals at the deck on the midship section numbers seven on each side, while this plan shows only six.

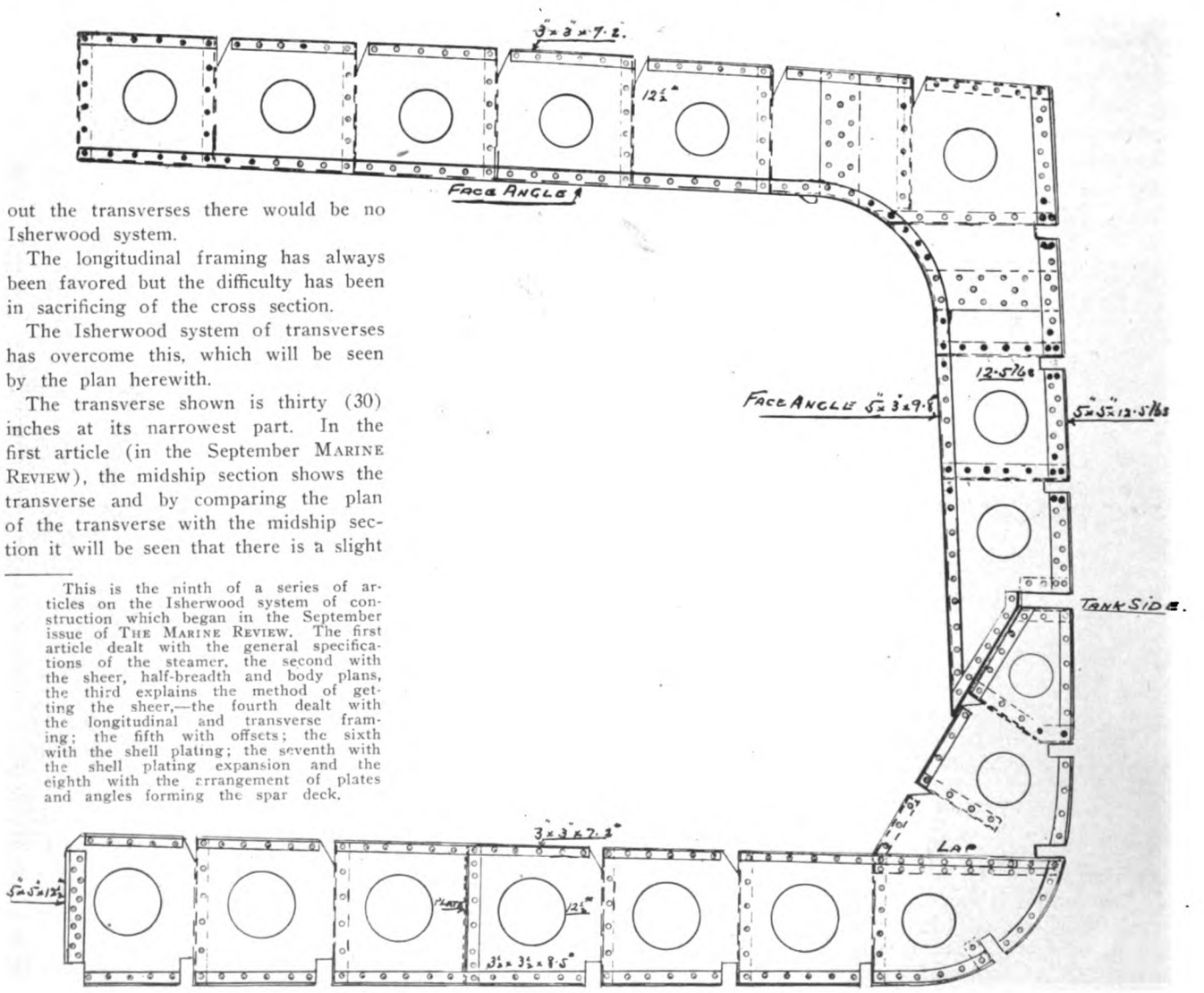
On the midship section angles are shown for the longitudinals to the shell, but as I have changed same to channels it requires a larger slot in the transverse plate in order for the channel to pass through.

It is not unusual to make changes in the design of a vessel as the maturing of the plans is accomplished. Some other section may be worked cheaper without in any way decreasing the strength of the vessel, and if done before ordering the materials it does not delay the progress of the work or effect any one.

"Scoring out" may want a little explanation for those not acquainted with the term used. The triangles and three-sided figures shown on the plan are slots for the longitudinal frames to pass through, and are as a rule punched out, so that the term "punched out" would be more suitable.

A line on a plan may be scored out, but to do so with a steel plate it would be troublesome.

At the sixth longitudinal from the center the floor part of the transverse is thirty inches wide, so that it is not necessary to make the section any wider,



TRANSVERSES

This is the ninth of a series of articles on the Isherwood system of construction which began in the September issue of THE MARINE REVIEW. The first article dealt with the general specifications of the steamer, the second with the sheer, half-breadth and body plans, the third explains the method of getting the sheer,—the fourth dealt with the longitudinal and transverse framing; the fifth with offsets; the sixth with the shell plating; the seventh with the shell plating expansion and the eighth with the arrangement of plates and angles forming the spar deck.

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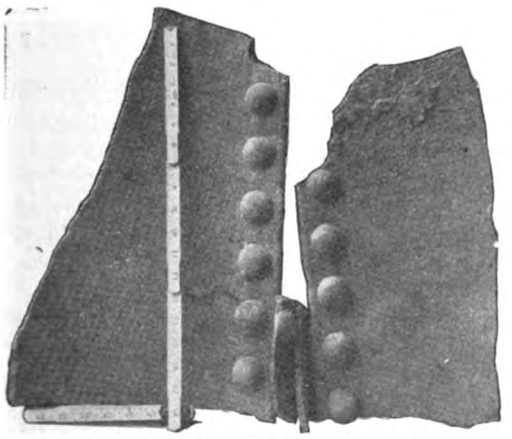
U S G Co's
Mexican Boiler Graphite



Scale removed from a water heater by
U S G CO'S MEXICAN BOILER GRAPHITE

A New Weapon that has won an old fight—THE FIGHT AGAINST SCALE.

For Years and tens of years Engineers have been fighting scale---
Fighting is hard---trying first one method of "preventing" scale then another---but never actually getting the upper hand.

This Did It

It will do the same for you

—then came Mexican Boiler Graphite

and the fight was won—Boiler Scale worries were ended—*Boiler Cleaning Made Easy.*

—MEXICAN BOILER GRAPHITE does its work by a gently *mechanical* action—is effective in any feed water regardless of its character, and unlike "chemicals" or compounds does not attack or "pit" the steel of a boiler.

—again acting *mechanically* not chemically it cannot cause "foaming" and being insoluble will not under normal conditions pass from a boiler with the steam.

—furthermore, MEXICAN BOILER GRAPHITE will keep your boilers free from that hard scale, so difficult to remove, and at *half the usual cost.*

—It is the ideal scale remedy—you've waited years for it, now it's here—Thousands of Engineers are using it today—Thousands more will use it before another year has passed—will you be one of them?

—If it delivers the goods—lives up to our claims—you ought to be using it today—Then why not investigate. Begin now—Write for our booklet H. THE MANAGEMENT AND CLEANING OF STEAM BOILERS—ask for testimonials and full particulars.

The United States Graphite Company

Mines—Near Torres, Sonora, Mexico

Main Offices and Factory: Saginaw, Mich., U. S. A.

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Philadelphia, 1822 Land Title Bldg.
Pittsburgh, Fulton Bldg.
Chicago, 630 Railway Exchange
Denver, 606 Gas & Electric Bldg.
San Francisco, 669 Phelan Bldg.
Detroit, 307 Free Press Bldg.
Cleveland, 1111 Superior Viaduct
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but care must be taken not to reduce the section to less than that agreed on.

As shown by the first article on the midship section the width of the transverses is 30 in. x 12.5 lbs. per square foot. The face angle running from the hopper side on the inner edge of the transverse forming a ring on the section is 5 in. x 3 in. x 9.8 lbs. per foot.

This face angle, it will be noticed, has the inner or 5-in. flange fitted so that it is seen in the hold. By this arrangement it covers the rough sheared plate and makes a nice finish of the transverse. The shell angles above the tank side are 5 in. x 5 in. x 12.5 lbs. In the bottom they are 3.5 in. x 3.5 in. x 8.5 lbs. The angle connecting the center keelson and floor plate is the same size as the clips to the shell plating above the tank. The balance of the angles on the section are 3 in. x 3 in. x 7.21 lbs.

As described in the specifications in the first article, the tank top is dropped as the side 3 inches and the rise of floor 3 inches, which makes the transverse 6 inches narrower at the tank side than at the center, which is 3 feet, the depth of the center keelson. This is taken as the unavoidable weakest part of the section. This will be proved later if sufficient when considering the strength of materials.

The transverses are stations in the fairing up plans and are spaced 6.16 feet apart, not 3.36, as stated in the October issue.

The transverses are shown in plan in December issue, and shapes given in January issue. The plan herewith shows transverses Nos. 3, 4, 5, 7, 9, 11, 13, 15, 17 and 19, and are spaced 12.8¾ in. apart. This takes in the whole of the cargo hold. The lower part enclosed in the water bottom up to the tank side line, as described in the March issue is spaced 6 ft. 4⅜ in. apart between the collision and the after end of hold bulkheads. From No. 20 to 31 they are spaced 2 ft. 0 in. apart. The tank side line abaft No. 20 is 33 inches above the keel, so that the transverses are riveted to the margin plate and the same strength retained as amidships.

The transverse No. 1 is reduced to 12 inches wide, which is ample for it.

Ore on Dock May 1

Statistics gathered by THE MARINE REVIEW from the various dock managers at Lake Erie ports show that the amount of ore on Lake Erie docks on May 1 of the present year was 5,706,477 tons, as against 5,881,245 tons in 1912, a decrease of 174,768 tons.

The total rail shipments from Lake Erie ports to furnaces during the winter season (Dec. 1 to May 1) aggregate 3,790,691 tons, viz.:

	Tons.
On dock Lake Erie ports, Dec. 1, 1912	9,497,168
On dock May 1, 1913	5,706,477
By rail to furnaces, winter of 1912-1913	3,790,691

Adding these winter shipments to 33,849,930 tons, the amount shipped to furnaces during the navigation season of 1912, gives 37,640,621 tons as the entire consumption of ore from Lake Erie ports during the year ended May 1, 1913, as against 26,428,799 tons for the year ending May 1, 1912, as against 32,636,692 tons for the year ended May 1, 1911, as against 33,599,013 tons for the year ended May 1, 1910, as against 20,524,523 tons for the year ended May 1, 1909, as against 31,692,446 tons for the year ended May 1, 1908, as against 30,089,769 tons for the year ended May 1, 1907, as against 28,984,358 tons for the year ended May 1, 1906; 20,057,070 tons for the year ended May 1, 1905; 18,739,995 tons for the year ended May 1, 1904; 21,905,251 tons for the year ended May 1, 1903; 17,216,065 tons for the year ended May, 1, 1902; 14,465,260 tons for the year ended May 1, 1901; 15,882,881 tons for the year ended May 1, 1900.

The following table gives the amount of ore on dock at the close of navigation last year and the opening this year:

Ports.	May 1, 1913.	Dec. 1, 1912.
Buffalo	139,624	340,261
Erie	449,455	661,330
Conneaut	135,100	1,429,533
Ashtabula	2,105,817	3,350,553
Fairport	357,995	565,920
Cleveland	1,428,306	1,888,560
Lorain	399,705	320,713
Huron	293,006	385,810
Sandusky	2,485	2,472
Toledo	394,984	552,016
	5,706,477	9,497,168

Lake Erie Ore Receipts

Out of a total movement of 866,387 tons of ore during April, 262,047 tons went to Lake Erie ports, distributed as follows:

Port.	Gross tons.
Buffalo	64,168
Erie	2,953
Conneaut	50,185
Ashtabula	43,355
Fairport	.....
Cleveland	75,584
Lorain	.....
Huron	8,501
Sandusky	.....
Toledo	8,530
Detroit	8,771
Total	262,047

April Ore Shipments

Ore shipments during April were 866,387 tons as against 204,042 gross tons during 1912, an increase of 662,345 tons. The figures are somewhat surprising as the harbors of Lake Superior were practically ice-locked until the last week in April and the ore in addition was frozen in the pockets. The ease with which this quantity was moved, however, within a few days, furnishes a very good index of the capacity of the shipping docks. Following are the shipments by ports:

Port.	April, 1912.	April, 1913.
Escanaba	80,530	217,029
Marquette	.....	37,494
Ashland	8,288	53,481
Superior	64,416	252,875
Duluth	18,237	160,372
Two Harbors	32,571	145,136
	204,042	866,387
1913 increase		662,345

Commerce of Lake Superior

The report of the superintendent of St. Mary's Falls canal shows that 1,905,555 net tons of freight passed through the canal in April, 1913, as against 166,918 tons in April, 1912, and 792,587 tons in April, 1911. The American canal carried 1,203,000 tons against 702,555 tons for the Canadian canal, though the Canadian canal opened on April 14 and the American canal on April 18. Following is the summary:

EAST BOUND.

Articles.	Total.
Copper, short tons	1,053
Grain, bushels	7,238,352
Building stone, short tons	.....
Flour, barrels	263,290
Iron ore, short tons	292,918
Pig iron, short tons	.....
Lumber, M. ft. B. M.	637
Silver ore, short tons	.....
Wheat, bushels	19,383,055
General merchandise, short tons	16,171
Passengers, number	26

WEST BOUND.

Coal, hard, short tons	214,814
Coal, soft, short tons	514,384
Flour, barrels	.....
Grain, bushels	.....
Manufactured iron, short tons	28,237
Iron ore, short tons	.....
Salt, barrels	6,957
General merchandise, short tons	48 982
Passengers, number	167

SUMMARY.

Vessel passages, number	582
Registered tonnage, net	1,517,333
Freight—	
East bound, short tons	1,098,123
West bound, short tons	807,432
Total freight, short tons	1,905,555

The twin-screw gasoline power yacht Lurline was launched from the yard of the Gas Engine & Power Co. and Charles L. Seabury & Co., Morris Heights, New York, on April 22. The Lurline is 65 ft. over all, 12 ft. beam and 4 ft. draught, and is equipped with two four-cylinder, 6 x 6 Speedway gasoline engines of 40 H. P. each.

The bulk freighter Richard Trimble, the last of the three 600-footers building for the Pittsburgh Steamship Co., was launched from the Lorain yards of the American Ship Building Co. on April 19.

The steamer Wm. H. Wolf struck the steamer J. K. Dimmick outside of Buffalo harbor in a dense fog on April 23. The damage will amount to about $10,000.

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These boilers hold the record for economy, capacity and endurance in the Navies of the World.

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Is a reduction in your coal bill of any interest to you?

Babcock & Wilcox Boilers have all essential parts heavier than corresponding parts in Scotch boilers, giving greater security against corrosion. They are lighter, safer, easier to clean and to operate than Scotch boilers, and much more efficient.

We are constantly receiving "repeat orders" from owners of merchant vessels who have had many years' satisfaction from the earlier installations.

Write us for details

Thermit Weld on Sternpost of Steamship "William Henry Mack"

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The Thermit Welding Process is quick, easy and effective—and when applied to broken rudderframes, sternposts, or sternframes, will enable your vessel to return to service in two or three days, effecting a tremendous saving in dry dock charges.

There is nothing experimental about Thermit Welding. During the last few years we have executed many repairs for the principal steamship companies of the Atlantic and Pacific coasts and the Great Lakes and every repair has been uniformly successful and our best advertisement.

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If you are interested obtain our new pamphlet No. 3440 and Reactions, which illustrate and describe many marine repairs and contain full information about the process. Every marine man should have one.

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If at the end of that period, same has proven satisfactory, it is to be paid for; if found unsatisfactory, the remaining unused portion is to be returned to you AT YOUR EXPENSE and no charge made to us for that used in making the test.

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Items of General Interest

The Welland canal opened for traffic for the season on April 15.

William B. Dickson has resigned as president of the International Steam Pump Co.

The Buffalo office of the Great Lakes Dredge & Dock Co. is now located in the D. S. Morgan building.

Logan & Rankin, marine architects, have removed from the Western Reserve building to 519 Rockefeller building, Cleveland.

McCutchen, Olney & Willard, admiralty lawyers, 1107 Merchants' Exchange building, San Francisco, have succeeded the firm of Page, McCutchen, Knight & Olney.

The Noronic, the passenger steamer building at the yard of the Western Shipbuilding & Dry Dock Co., Port Arthur, Ont., for the Northern Navigation Co., will be launched on May 24.

The Prudential Trust Co. have been appointed transfer agents and the Royal Trust Co. registrars for the Richelieu & Ontario Navigation Co., of Montreal.

Mortimer L. Schiff has resigned as director and member of the executive committee of the Pacific Mail Steamship Co. E. P. Swenson was elected to both positions.

The British convict ship Success, built in 1790, but which has been out of commission as a prison ship, is now in New York harbor on exhibition.

Lawrence M. Thompson, formerly of the lighthouse service, has opened an office as naval architect and engineer in the Velati building, Ninth and G streets, Washington, D. C.

C. J. Smith, formerly general manager of the Richelieu & Ontario Navigation Co., has been appointed vice president and general manager of the North railway, with offices at Montreal.

The Polson Iron Works, Toronto, Ont., has given orders to Engberg's Electric & Mechanical Works, St. Joseph, Mich., for two generating sets, search-lights, etc., to be used in connection with Dominion contracts.

The Standard Oil Co., Baton Rouge, La., has plans prepared for a steel hull towboat 116 ft. by 29½ ft. by 5½ ft. to be equipped with a compound engine and Babcock & Wilcox boilers.

The Japanese Steamship Co. intends to inaugurate through steamship service from Japan to the eastern coast of the United States as soon as the Panama canal is opened.

The Joseph Dixon Crucible Co., Jersey City, N. J., has just published a booklet entitled "Graphite for the Boiler," which will be mailed to any one upon request. The efficacy of graphite in the removal of scale is well known.

The United States Federal court, of Philadelphia, has authorized the sale of the Philadelphia & Gulf Steamship Co. The property will be taken over by a new company to be known as the Philadelphia-New Orleans Transportation Co.

The naval collier Nereus was launched from the yard of the Newport News Ship Building & Dry Dock Co., Newport News, Va., on April 26. The Nereus is 522 ft. over all, 62 ft. beam and 27 ft. 6 in. deep and will carry 12,500 tons of coal.

The Mutual Co. of New York has given contract to the Robert Palmer Ship Building Co., of Noank, Conn., for a tug 110 ft. long by 23½ ft. beam by 10½ ft. deep, to the named Britannia.

The Pratt Iron Works Co., Dayton, O., announces that it started up in all departments on April 21 and is prepared to take care of all orders for pumps, compressors, condensers, feed water heaters and mill machinery.

The Hyde Windlass Co., Bath, Me., will furnish the steam windlasses and donkey boilers for the fleet of wooden barges now building at the Jackson & Sharp plant of the American Car & Foundry Co., Wilmington, Del., for the Hilton-Dodge Lumber Co., Savannah, Ga.

Charles E. Bird, Saugatuck, Mich., has just built and launched a wooden steamer 65 ft. long, 12 ft. 8 in. beam, and 6 ft. 3 in. deep, to be equipped with a fore and aft compound engine 6 and 12 by 8 in. supplied with steam from a boiler 54 in. by 84 in. allowed 200 lbs. steam pressure.

The Gas Engine & Power Co. and Charles L. Seabury & Co., Consolidated, Morris Heights, New York, are building two high-speed launches for Vincent Astor and Herman Oelrichs, to be 55 ft. long and to be equipped with two six-cylinder, 7 x 7 Speedway engines driving twin screws.

VERY NEW HAND (On lookout and sighting red, white and green lights of steamer ahead)—PLAZE, SOR, THERE'S A DRUG SCHTOOR RIGHT AHEAD, SOOR

The establishment of the Pratt School of Naval Architecture and Marine Engineering is assured to the Massachusetts Institute of Technology by a recent decision of the court. This gift of $750,000 was entirely unexpected, as neither President Maclaurin nor Prof. C. H. Peabody had any real acquaintanceship with Mr. Pratt.

The United States Graphite Co., Saginaw, Mich., has just issued general catalog and price list No. 19, intended to serve the trade only as a convenient reference. More complete and comprehensive information with regard to any of the company's products will be found in special pamphlets to be had upon request. The general catalog is very beautifully printed and illustrated.

The Allan line will add the new quadruple screw turbine steamer Calgarean to its Montreal service this summer. The new steamer, which is a product of the Fairfield yard on the Clyde, is subdivided both athwartships and longitudinally, and its double bottom is carried well above the water line to a watertight deck.

The Richelieu & Ontario Navigation Co. has taken over the Lake Ontario and Bay of Quinte Steamboat Co., operating from the Bay of Quinte to Thousand Islands. E. E. Horsey, formerly general manager, has been appointed assistant to the manager, western lines, Richelieu & Ontario Navigation Co., with headquarters at Kingston, Ont.

The bidders for the removal of the wreck of the steel whaleback barge Bangor, sunk in Hampton Roads, were W. H. French, Norfolk, Va.; Coastwise Dredging Co., Norfolk, Va.; King & Wotherspoon, 149 Broadway, New York, and Johnston & Virden, Lewes, Del. W. H. French was the lowest bidder for removing the wreck by the use of explosives and raising the pieces at $8,235. The Coastwise Dredging Co. offered to sink the wreck with 40 ft. of water over it for $6,950. King & Wotherspoon offered to remove the wreck bodily for $15,000.

Counsel: "Then you think he struck you with malice aforethought?" Witness, indignantly: "You can't mix me up like that. I've told you twice he hit me with a brick. There wasn't no mallets nor nothin' of the kind about."

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